Oceanographic Observations During Fisheries Research Surveys off the British Columbia Coast in 1980-81

A. J. Dodimead and A. Ballantyne

Department of Fisheries and Oceans
Fisheries Research Branch
Pacific Biological Station
Nanaimo, British Columbia V9R 5K6

February 1984

Canadian Data Report of Fisheries and Aquatic Sciences No. 442

Canadian Data Report of Fisheries and Aquatic Sciences

These reports provide a medium for filing and archiving data compilations where little or no analysis is included. Such compilations commonly will have been prepared in support of other journal publications or reports. The subject matter of Data Reports reflects the broad interests and policies of the Department of Fisheries and Oceans, namely, fisheries management, technology and development, ocean sciences, and aquatic environments relevant to Canada.

Numbers 1-25 in this series were issued as Fisheries and Marine Service Data Records. Numbers 26-160 were issued as Department of Fisheries and the Environment, Fisheries and Marine Service Data Reports. The current series name was changed with report number 161.

The correct citation appears above the abstract of each report.

Rapport statistique canadien des sciences halieutiques et aquatiques

Ces rapports servent de base à la compilation des données de classement et d'archives pour lesquelles il y a peu ou point d'analyse. Cette compilation aura d'ordinaire été préparée pour appuyer d'autres publications ou rapports. Les sujets des Rapports statistiques reflètent la vaste gamme des intérêts et politiques du Ministère des Pêches et des Océans, notamment gestion des pêches, techniques et développement, sciences océaniques et environnements aquatiques, au Canada.

Les numéros 1 à 25 de cette série ont été publiés à titre de Records statistiques, Service des pêches et de la mer. Les numéros 26-160 ont été publiés à titre de Rapports statistiques du Service des pêches et de la mer, Ministère des Pêches et de l'Environnement. Le nom de la série a été modifié à partir du numéro 161.

Le titre exact paraît au haut du résumé de chaque rapport.

Canadian Data Report of

Fisheries and Aquatic Sciences No. 442

February 1984

OCEANOGRAPHIC OBSERVATIONS DURING FISHERIES RESEARCH SURVEYS OFF THE BRITISH COLUMBIA COAST IN 1980-81.

by

A. J. Dodimead and A. Ballantyne

Department of Fisheries and Oceans

Fisheries Research Branch

Pacific Biological Station

Nanaimo, British Columbia V9R 5K6

(c)Minister of Supply and Services Canada 1984

Cat. No. Fs97-13/442 ISSN 0706-6465

ABSTRACT

Dodimead, A. J. and A. Ballantyne. 1984. Oceanographic observations during fisheries research surveys off the British Columbia coast in 1980-81. Can. Data Rep. Fish. Aquat. Sci. No. 442: iii + 91 p.

Temperature-depth data collected during twelve fisheries research surveys of the waters off the British Columbia coast in 1980-81 are reported. A summary of oceanographic conditions for this period is also provided. Anomalies in the monthly mean sea-surface temperature data from the lightstations indicate above-average to very warm surface conditions for the coastal waters throughout 1980-81. Sea-surface temperature anomalies from October 1980 through March 1981 and from September through December 1981 were generally larger than those for corresponding periods in 1957-58. Bottom-water temperatures were also anomalously high off the west coast of Vancouver Island from January through March of 1981.

Key words: Oceanographic data, British Columbia coast, temperature conditions.

RÉSUMÉ

Dodimead, A. J. and A. Ballantyne. 1984. Oceanographic observations during fisheries research surveys off the British Columbia coast in 1980-81. Can. Data Rep. Fish. Aquat. Sci. No. 442: iii + 91 p.

Les données de température-profondeur recueillies lors de douze séries de recherches halieutiques effectuées en 1980-1981 dans les eaux du large de la Colombie-Britannique sont présentées. On donne aussi un aperçu des conditions océanographiques pendant cette période. Des anomalies de la noyenne mensuelle de la température des eaux de surface aux phares indiquent une température de surface allant de supérieure à la moyenne à très chaude pour les eaux côtières tout au long de 1980-1981. Les anomalies de température des eaux de surface des périodes d'octobre 1980 à mars 1981 et de septembre à décembre 1981 étaient généralement plus importantes que celles notées lors des périodes correspondantes en 1957-1958. La température des eaux du fond a aussi été anormalement élevée au large de la côte ouest de l'île Vancouver de janvier à mars 1981.

Mots clés: données océanographiques, côte de la Colombie-Britannique, températures.

I. INTRODUCTION

The collection of oceanographic data by Fisheries Research Branch personnel participating in research surveys of the waters off the British Columbia coast was continued during 1980-81. A chart showing the approximate positions of the stations occupied, together with tables of data, are presented for each cruise in chronological order.

The oceanographic observations included temperature vs depth - determined primarily by means of expendable bathythermographs (XBT) - and a few surface salinities. The temperature-depth traces were manually digitized to adequately reproduce the traces, generally at standard oceanographic depths and/or at inflection points.

A brief description of the oceanographic conditions of the continental shelf and slope waters off the west coast of Vancouver Island and in Queen Charlotte Sound and Hecate Strait that prevailed during 1980-81, together with comparisons to other periods, is provided. Other data reports of this format are available for 1977-79 (Dodimead et al. 1979a,b; Dodimead and Ballantyne 1980). The data have also been archived by Marine Environmental Data Service, Fisheries and Oceans, Ottawa.

II. CRUISES AND DATA

The cruises and data reported are:

A. 1980.

1. West coast of Vancouver Island - CALLISTRATUS, January 24-28, 1980 (Fig. 1, Table 1).

2. West coast of Vancouver Island and Queen Charlotte Sound - G.B. REED, May 7-21, 1980 (Fig. 2a,b, Table 2).

3. Southwest coast of Vancouver Island - OCEAN KING, May 26-June 7, 1980 (Fig. 3, Table 3).

4. Northwest coast of Vancouver Island - BLUE WATERS, August 8-13, 1980 (Fig. 4, Table 4).

8. 1981.

1. Southwest coast of Vancouver Island - ARCTIC HARVESTER, February 1-3, 1981 (Fig. 5, Table 5).

2. West coast of Vancouver Island - ARCTIC HARVESTER, Marcn 8-14, 1981 (Fig. 6, Table 6).

3. West coast of Vancouver Island and Queen Charlotte Sound - G.B. REED, May 6-20, 1981 (Fig. 7a,b, Table 7).

4. Hecate Strait - TENACIOUS, June 7-16, 1981 (Fig. 8, Table 8).

5. Queen Charlotte Sound - G.B. REED, July 5-16, 1981 (Fig. 9, Table 9).

6. Queen Charlotte Sound and Hecate Strait - ARCTIC OCEAN, August 7-18, 1981 (Fig. 10, Table 10).

7. Queen Charlotte Sound and Hecate Strait - G.B. REED, August 12-25, 1981 (Fig. 11, Table 11).

8. Southwest coast of Vancouver Island - G.B. REED, September 10-23, 1981 (Fig. 12, Table 12).

Fig. 1. Station positions, January 24-28, 1980.

Table 1.

AREA: West coast Vancouver Island **DATE:** January 24-28, 1980 **VESSEL:** CALLISTRATUS

No.	Day/Mo.	Time (PST)	Position		Bottom depth (m)	Depth (m)/Temperature (°C)																	
			Lat. N	Long. W																			
1	24/01	1750	48°55'	126° 25'	140	0	30	40	50	75	80	115	125	130	140								
						9.7	9.7	10.0	10.0	10.0	9.9	9.8	9.5	9.0	8.7								
2	25/01	0020	49°10'	127°08'	900	0	10	20	30	90	100	115	125	150	175	200	210	250	300	400	410	450	
						8.0	8.5	8.8	9.4	9.4	9.0	8.8	8.4	8.2	8.2	7.8	7.6	7.2	6.9	6.2	6.0	6.0	
3	25/01	1830	49°40'	127°38'	420	0	10	20	32	50	60	75	100	125	150	175	200	250	300	400			
						9.2	9.4	9.5	9.7	8.8	9.2	8.8	8.3	8.2	8.0	7.7	7.3	6.7	6.3	5.7			
4	26/01	0700	49°55'	127°23'	50	0	10	20	30	50													
						7.2	7.3	8.5	9.2	10.0													
5	26/01	0730	49°51'	127°24'	75	0	10	20	30	50	70	75											
						7.5	9.0	10.2	10.2	10.2	10.0	10.0											
6	26/01	0810	49°47'	127°31'	85	0	10	20	25	30	50	75	85										
						8.3	9.2	9.7	9.6	9.6	9.6	9.5	9.4										
7	26/01	2115	49°16'	127°02'	415	0	10	15	20	30	50	75	105	125	150	175	200	250	300	415			
						8.2	8.6	8.6	9.5	9.5	9.7	10.2	10.0	9.5	9.0	7.6	7.0	6.3	5.7	5.7			
8	27/01	1000	48°54'	126°32'	165	0	10	20	30	50	75	85	100	125	150	165							
						8.8	9.7	9.5	9.7	10.0	10.0	9.8	9.2	8.3	7.5	7.2							
9	28/01	1420	49°27'	126°50'	100	0	10	20	30	45	50	75	85	100									
						8.0	8.3	9.2	9.2	9.5	9.7	9.7	9.5	9.0									

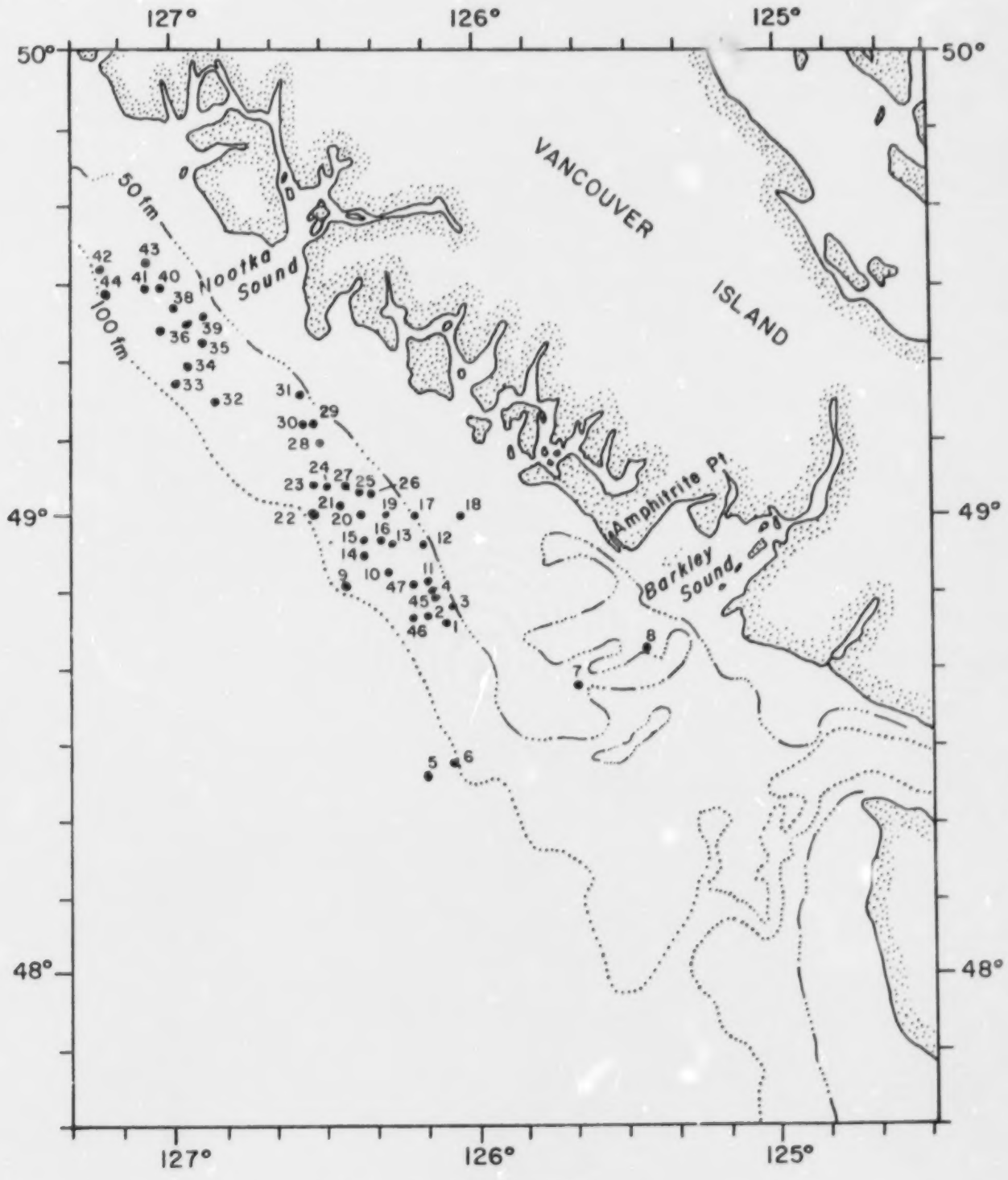

Fig. 2a. Station positions, May 7-21, 1980.

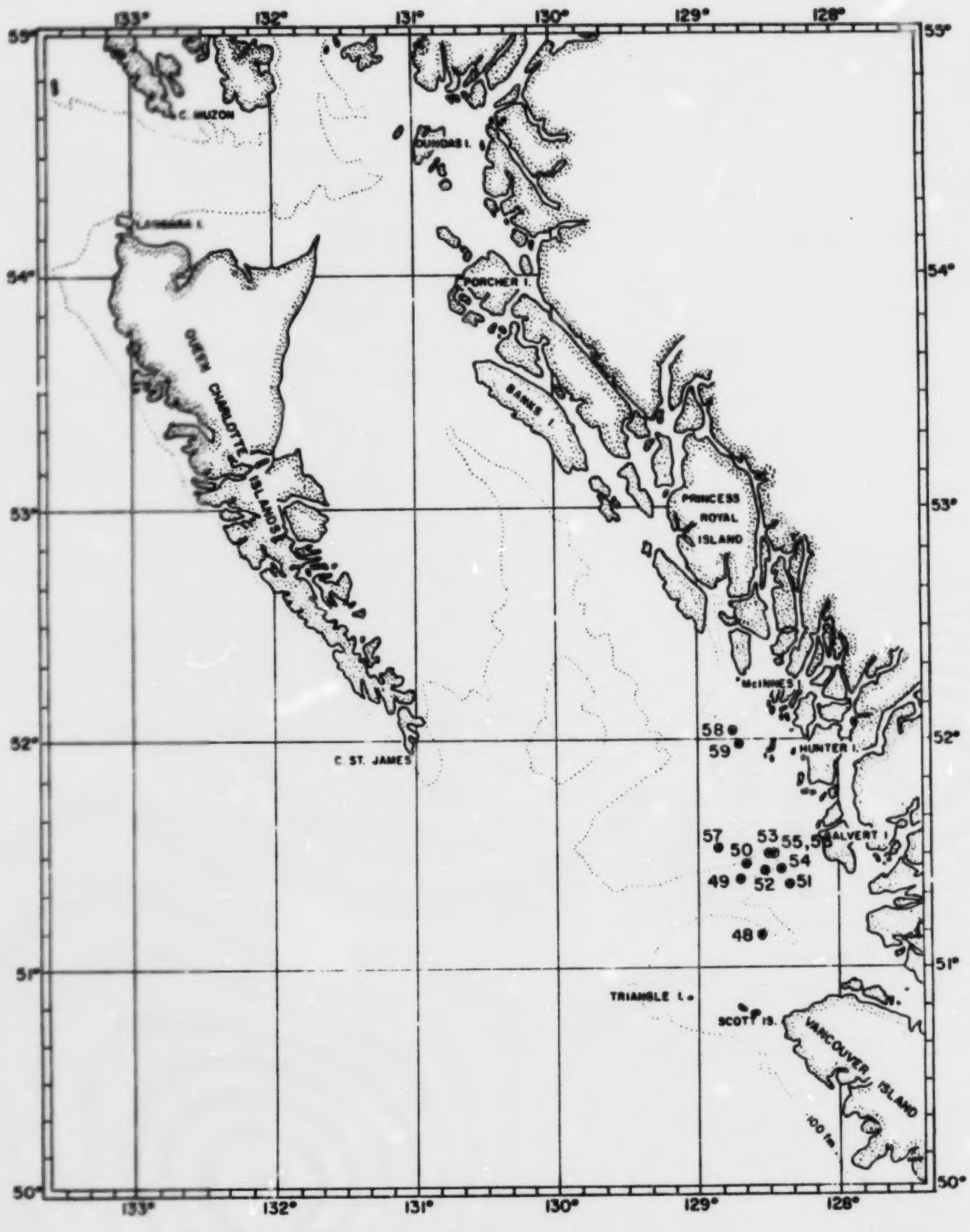

Fig. 2b. Station positions, May 7-21, 1980.

Table 2.

AREA: West coast Vancouver Island/ Queen Charlotte Sound

DATE: Shrimp Cruise May 7-21/1980

VESSEL: G.B. REED

No.	Day/Mo.	Time (PST)	Position		Bottom depth (m)	Depth (m)/Temperature (°C)															Depth (m) Salinity (‰)	
			Lat. N	Long. W																		
1	7/5	0900	48°46'	126°07'	120	0	15	20	30	50	75	85	100	110	120							
						10.8	10.5	10.2	9.5	9.0	8.7	8.5	8.5	7.8	7.8							
2	7/5	1125	48°47'	126°10'	130	0	25	50	75	100	115	130										
						11.2	9.9	9.4	9.2	8.7	8.0	7.8										
3	7/5	1340	48°48'	126°05'	95	0	25	50	60	65	95											
						10.6	9.5	9.0	8.8	8.6	8.5											
4	7/5	1610	48°50'	126°09'	115	0	05	20	35	50	75	95	100	115								
						12.2	11.0	9.9	9.5	9.2	8.9	8.9	8.0	7.9								
5	7/5	2035	48°26'	126°10'	340	0	15	25	50	60	75	90	100	120	150	200	250	300	340			
						11.4	10.6	10.0	9.4	9.1	9.2	9.0	8.7	8.0	7.7	6.6	6.1	5.5	5.3			
6	7/5	2100	48°28'	126°05'	178	0	05	25	50	60	85	100	120	155	178							
						11.3	10.6	10.4	9.3	9.1	9.0	8.0	7.1	7.1	6.5							
7	7/5	2244	48°37'	125°41'	128	0	10	23	45	55	75	85	100	128								
						11.8	11.8	9.7	9.7	9.4	8.4	8.0	7.7	7.4								
8	7/5	2400	48°43'	125°28'	132	0	10	20	50	90	100	110	132									
						11.6	11.8	9.6	9.4	9.2	9.0	8.7	8.6									
9	8/5	1135	48°51'	126°16'	143	0	10	25	50	85	95	115	130	143								
						11.0	10.8	9.8	9.1	8.5	8.3	8.0	7.4	7.3								
10	8/5	1316	48°53'	126°18'	147	0	05	12	35	50	70	95	110	125	133	147						
						11.2	10.8	10.3	9.5	9.4	9.0	8.9	8.3	8.0	7.4	7.4						
11	8/5	1640	48°52'	126°10'	110	0	15	25	50	68	88	100	103	110								
						11.5	11.2	9.5	9.2	8.8	8.5	8.0	7.7	7.7								
12	8/5	1820	48°56'	126°11'	109	0	10	25	50	75	95	100	109									
						11.7	11.5	10.2	9.6	9.1	8.3	8.2	8.2									
13	9/5	0840	48°56'	126°17'	135	0	08	30	50	65	90	100	110	120	135							
						11.2	11.0	9.4	9.0	8.8	8.6	8.4	8.0	7.5	7.3							
14	9/5	1115	48°55'	126°23'	153	0	15	20	50	65	100	120	140	153								
						10.8	10.5	9.4	9.2	8.9	8.4	8.0	7.0	7.0								
15	9/5	1330	48°57'	126°22'	149	0	03	20	25	45	65	90	100	110	125	130	149					
						11.5	10.8	10.6	10.1	9.2	8.9	8.7	8.5	8.0	7.8	7.0	7.0					

Table 2 (cont'd)

AREA: West coast Vancouver Island/ Queen Charlotte Sound

DATE: Shrimp Cruise May 7-21/1980

VESSEL: G.B. REED

No.	Day/Mo.	Time (PST)	Position		Bottom depth (m)	Depth (m)/Temperature (°C)															Depth (m) Salinity (‰)	
			Lat. N	Long. W																		
16	9/5	1610	48°57'	126°19'	130	0	04	10	25	35	50	65	83	90	108	117	130					
						12.0	11.2	10.8	9.7	9.3	9.2	8.8	8.7	8.2	8.2	7.3	7.3					
17	9/5	1721	49°00'	126°13'	100	0	15	25	32	50	68	75	100									
						11.5	10.5	9.5	9.2	9.2	9.0	8.5	8.1									
18	9/5	1816	49°00'	126°04'	-	0	05	12	18	20												
						11.5	10.3	10.0	9.8	9.4												
19	10/5	1105	49°00'	126°18'	118	0	05	25	35	50	75	90	100	118								
						11.5	10.9	10.6	9.6	9.4	8.9	8.5	8.0	7.8								
20	10/5	1340	49°00'	126°23'	130	0	10	22	23	50	53	55	62	85	100	110	130					
						11.7	10.5	10.0	10.2	9.9	9.7	10.3	9.9	9.5	9.1	9.0	8.3					
21	10/5	1625	49°02'	126°27'	143	0	05	15	30	50	88	90	100	120	143							
						11.3	11.0	11.2	9.5	9.3	9.2	9.0	8.9	7.5	7.5							
22	10/5	1828	49°00'	126°32'	-	0	10	15	30	35	50	65	78	95	100	115	120					
						11.0	11.0	10.5	10.0	9.6	9.6	9.0	8.9	8.9	8.7	8.5	8.0					
23	11/5	0740	49°04'	126°33'	142	0	20	25	40	50	65	93	100	112	130	142						
						10.9	10.0	9.8	9.7	9.1	8.8	8.7	8.5	8.0	7.4	7.4						
24	11/5	1000	49°04'	126°29'	132	0	15	25	30	45	55	80	100	110	130	132						
						11.0	10.1	10.0	9.5	9.0	8.7	8.5	8.3	7.8	7.7	7.4						
25	11/5	1210	49°03'	126°23'	125	0	12	30	50	60	90	100	110	125								
						11.2	9.8	9.2	9.1	8.8	8.8	8.3	7.6	7.4								
26	11/5	1430	49°03'	126°21'	104	0	15	25	40	50	68	85	95	100	104							
						11.3	10.5	10.0	9.3	9.2	8.9	8.7	8.7	8.2	8.1							
27	11/5	1700	49°04'	126°26'	131	0	03	20	30	50	65	70	88	92	95	100	115	131				
						11.6	10.8	9.1	8.9	8.7	8.7	8.5	8.5	8.2	8.3	8.0	7.5	7.4				
28	12/5	0635	49°09'	126°31'	123	0	10	25	50	75	90	100	123									
						11.1	11.0	10.0	9.1	8.4	8.0	7.8	7.7									
29	13/5	0930	49°12'	126°32'	-	0																
						11.9																
30	13/5	1410	49°12'	126°34'	120	0	25	40	50	65	80	90	100	120								
						12.2	10.0	9.2	9.1	8.7	8.3	8.1	7.7	7.7								

Table 2 (cont'd)

AREA: West coast Vancouver Island/ Queen Charlotte Sound

DATE: May 7-21, 1980

VESSEL: G.B. REED

No.	Day/Mo.	Time (PST)	Position		Bottom depth (m)	Depth (m)/Temperature (°C)															Depth (m) Salinity (‰)	
			Lat. N	Long. W																		
31	13/5	1645	49°16'	126°35'	-	0																
						12.4																
32	14/5	0810	49°11'	126°55'	-	0																
						11.1																
33	14/5	1115	49°17'	126°59'	158	0	15	25	50	55	80	90	100	110	125	150	158					
						11.5	10.3	9.3	8.7	8.6	8.4	8.5	8.5	8.1	7.4	7.2	7.1					
34	14/5	1400	49°19'	126°56'	150	0	10	20	40	50	73	80	90	100	130	150						
						11.8	11.2	9.6	9.1	9.0	8.3	8.5	8.6	8.5	7.3	7.3						
35	14/5	1700	49°23'	126°54'	128	0	10	20	23	25	30	50	80	95	100	110	115	128				
						11.8	10.5	10.0	9.6	9.8	9.6	8.8	8.7	8.3	8.2	7.8	7.4	7.3				
36	15/5	0710	49°25'	126°57'	140	0	10	22	25	35	50	55	65	80	100	110	130	140				
						11.3	9.9	9.4	9.6	9.5	9.0	8.9	8.6	8.6	8.2	8.0	7.5	7.4				
37	15/5	1000	49°24'	127°01'	135	0	10	25	50	60	70	75	100	110	115	135						
						11.2	10.0	9.4	8.5	8.2	8.2	8.5	8.0	7.6	7.4	7.4						
38	15/5	1210	49°27'	126°59'	120	0	10	25	30	50	75	95	100	110	120							
						12.2	10.0	9.6	8.9	8.7	8.5	8.2	7.8	7.7	7.5							
39	15/5	1425	49°26'	126°54'	115	0	05	15	20	30	45	50	75	95	100	115						
						12.8	12.0	10.3	10.0	9.6	9.8	9.2	9.0	8.5	8.2	8.1						
40	16/5	0845	49°29'	127°01'	115	0	10	15	20	30	50	70	80	100	105	115						
						12.2	10.0	9.2	9.6	9.0	8.6	8.5	8.4	7.5	7.3	7.3						
41	16/5	0935	49°29'	127°04'	136	0	08	15	40	50	60	80	90	100	110	120	136					
						11.8	11.7	10.0	8.7	8.5	8.6	8.5	8.1	8.0	7.2	7.0	7.0					
42	16/5	1255	49°32'	127°14'	156	0	10	20	30	50	75	90	100	105	125	150	156					
						11.4	11.3	9.2	8.5	8.3	8.3	8.0	7.9	7.5	7.2	6.7	6.6					
43	16/5	1520	49°33'	127°04'	122	0	15	40	50	55	60	85	90	100	110	122						
						11.8	9.3	8.6	8.7	8.4	8.5	8.4	7.8	7.5	7.3	7.2						
44	16/5	1820	49°28'	127°12'	165	0	10	25	42	50	90	100	120	140	150	165						
						11.8	11.5	9.5	8.7	8.5	8.5	8.2	8.0	7.1	7.0	7.0						
45	17/5	0845	48°49'	126°09'	113	0	10	25	50	80	95	100	105	113								
						12.3	11.8	9.4	9.1	8.5	8.4	7.9	7.6	7.6								

Table 2 (cont'd)

AREA: West coast Vancouver Island/ Queen Charlotte Sound

DATE: May 7-21, 1980

VESSEL: G.B. REED

No.	Day/Mo.	Time (PST)	Position		Bottom depth (m)	Depth (m)/Temperature (°C)															Depth (m) Salinity (‰)	
			Lat. N	Long. W																		
46	17/5	1155	48°47'	126°13'	152	0	10	25	40	50	55	75	90	100	130	152						
						12.7	10.7	9.5	9.5	9.0	8.8	8.7	8.5	8.4	7.3	7.3						
47	17/5	1312	48°51'	126°13'	127	0	05	10	23	25	50	95	100	112	127							
						13.0	10.7	10.1	9.4	9.5	8.8	8.7	8.3	7.6	7.5							
48	18/5	0830	51°10'	128°35'	167	0	05	15	25	35	50	60	78	80	100	115	130	145	167			
						10.7	10.5	10.4	8.7	8.3	8.3	8.2	8.2	7.8	7.4	6.9	6.7	6.5	6.5			
49	18/5	1250	51°25'	128°46'	220	0	05	25	50	65	85	100	105	125	150	155	160	175	200	220		
						10.7	10.1	8.7	8.6	8.4	8.3	8.1	7.8	7.7	7.0	7.0	6.5	6.2	5.9	5.9		
50	18/5	1530	51°28'	128°42'	190	0	10	25	30	50	70	75	100	115	130	150	157	190				
						11.8	9.7	9.5	8.8	8.7	8.6	8.5	8.4	8.4	7.9	7.0	6.1	6.1				
51	20/5	0740	51°22'	128°26'	203	0	18	25	32	50	55	60	100	110	125	150	175	200	203			
						9.8	9.8	9.2	8.9	8.7	8.6	8.7	8.6	8.4	8.2	7.5	6.6	6.4	6.4			
52	20/5	1000	51°26'	128°35'	203	0	15	25	50	72	100	120	140	150	155	200	203					
						9.6	9.6	8.7	8.6	8.3	8.3	8.2	7.4	6.7	6.2	6.1	6.1					
53	20/5	1255	51°30'	128°33'	175	0	10	20	40	50	95	100	125	140	150	155	175					
						9.7	9.5	9.1	8.5	8.4	8.3	8.2	8.0	6.3	6.2	6.0	6.0					
54	20/5	1505	51°26'	128°29'	193	0	15	20	25	30	50	55	65	100	110	130	150	155	193			
						9.4	9.1	9.3	9.3	9.2	9.0	8.4	8.3	8.3	8.1	7.8	6.5	6.3	6.2			
55	20/5	1620	51°30'	128°31'	190	0	12															
						10.0	9.5															
56	20/5	1655	51°30'	128°31'	190	0	25	30	50	65	100	120	125	150	170	190						
						9.9	9.5	9.1	8.8	8.3	8.3	8.0	8.0	6.0	5.9	5.9						
57	20/5	1830	51°31'	128°56'	47	0	25	47														
						9.8	9.7	9.7														
58	21/5	0900	52°02'	128°49'	170	0	20	22	30	33	50	55	75	100	120	130	150	170				
						9.7	9.5	10.4	9.5	8.9	8.4	8.3	8.4	7.8	7.5	7.1	6.8	6.6				
59	21/5	1130	51°59'	128°47'	164	0	10	25	50	60	75	80	100	125	140	150	164					
						9.7	9.6	10.0	9.3	9.2	9.2	9.6	9.1	8.3	8.6	8.3	8.2					

Table 2 (cont'd)

AREA: West coast Vancouver Island/ Queen Charlotte Sound

DATE: May 7-21, 1980

VESSEL: G.B. REED

No.	Day/Mo.	Time (PST)	Position		Bottom depth (m)	Depth (m)/Temperature (°C)															Depth (m) Salinity (‰)	
			Lat. N	Long. W																		
31	13/5	1645	49°16'	126°35'	-	0																
						12.4																
32	14/5	0810	49°11'	126°55'	-	0																
						11.1																
33	14/5	1115	49°17'	126°59'	158	0	15	25	50	55	80	90	100	110	125	150	158					
						11.5	10.3	9.3	8.7	8.6	8.4	8.5	8.5	8.1	7.4	7.2	7.1					
34	14/5	1400	49°19'	126°56'	150	0	10	20	40	50	73	80	90	100	130	150						
						11.8	11.2	9.6	9.1	9.0	8.3	8.5	8.6	8.5	7.3	7.3						
35	14/5	1700	49°23'	126°54'	128	0	10	20	23	25	30	50	80	95	100	110	115	128				
						11.8	10.5	10.0	9.6	9.8	9.6	8.8	8.7	8.3	8.2	7.8	7.4	7.3				
36	15/5	0710	49°25'	126°57'	140	0	10	22	25	35	50	55	65	80	100	110	130	140				
						11.3	9.9	9.4	9.6	9.5	9.0	8.9	8.6	8.6	8.2	8.0	7.5	7.4				
37	15/5	1000	49°24'	127°01'	135	0	10	25	50	60	70	75	100	110	115	135						
						11.2	10.0	9.4	8.5	8.2	8.2	8.5	8.0	7.6	7.4	7.4						
38	15/5	1210	49°27'	126°59'	120	0	10	25	30	50	75	95	100	110	120							
						12.2	10.0	9.6	8.9	8.7	8.5	8.2	7.8	7.7	7.5							
39	15/5	1425	49°26'	126°54'	115	0	05	15	20	30	45	50	75	95	100	115						
						12.8	12.0	10.3	10.0	9.6	9.8	9.2	9.0	8.5	8.2	8.1						
40	16/5	0845	49°29'	127°01'	115	0	10	15	20	30	50	70	80	100	105	115						
						12.2	10.0	9.2	9.6	9.0	8.6	8.5	8.4	7.5	7.3	7.3						
41	16/5	0935	49°29'	127°04'	136	0	08	15	40	50	60	80	90	100	110	120	136					
						11.8	11.7	10.0	8.7	8.5	8.6	8.5	8.1	8.0	7.2	7.0	7.0					
42	16/5	1255	49°32'	127°14'	156	0	10	20	30	50	75	90	100	105	125	150	156					
						11.4	11.3	9.2	8.5	8.3	8.3	8.0	7.9	7.5	7.2	6.7	6.6					
43	16/5	1520	49°33'	127°04'	122	0	15	40	50	55	60	85	90	100	110	122						
						11.8	9.3	8.6	8.7	8.4	8.5	8.4	7.8	7.5	7.3	7.2						
44	16/5	1820	49°28'	127°12'	165	0	10	25	42	50	90	100	120	140	150	165						
						11.8	11.5	9.5	8.7	8.5	8.5	8.2	8.0	7.1	7.0	7.0						
45	17/5	0845	48°49'	126°09'	113	0	10	25	50	80	95	100	105	113								
						12.3	11.8	9.4	9.1	8.5	8.4	7.9	7.6	7.6								

Table 2 (cont'd)

AREA: West coast Vancouver Island/ Queen Charlotte Sound

DATE: May 7-21, 1980

VESSEL: G.B. REED

No.	Day/Mo.	Time (PST)	Position		Bottom depth (m)	Depth (m)/Temperature (°C)															Depth (m) Salinity (‰)	
			Lat. N	Long. W																		
46	17/5	1155	48°47'	126°13'	152	0	10	25	40	50	55	75	90	100	130	152						
						12.7	10.7	9.5	9.5	9.0	8.8	8.7	8.5	8.4	7.3	7.3						
47	17/5	1312	48°51'	126°13'	127	0	05	10	23	25	50	95	100	112	127							
						13.0	10.7	10.1	9.4	9.5	8.8	8.7	8.3	7.6	7.5							
48	18/5	0830	51°10'	128°35'	167	0	05	15	25	35	50	60	78	80	100	115	130	145	167			
						10.7	10.5	10.4	8.7	8.3	8.3	8.2	8.2	7.8	7.4	6.9	6.7	6.5	6.5			
49	18/5	1250	51°25'	128°46'	220	0	05	25	50	65	85	100	105	125	150	155	160	175	200	220		
						10.7	10.1	8.7	8.6	8.4	8.3	8.1	7.8	7.7	7.0	7.0	6.5	6.2	5.9	5.9		
50	18/5	1530	51°28'	128°42'	190	0	10	25	30	50	70	75	100	115	130	150	157	190				
						11.8	9.7	9.5	8.8	8.7	8.6	8.5	8.4	8.4	7.9	7.0	6.1	6.1				
51	20/5	0740	51°22'	128°26'	203	0	18	25	32	50	55	60	100	110	125	150	175	200	203			
						9.8	9.8	9.2	8.9	8.7	8.6	8.7	8.6	8.4	8.2	7.5	6.6	6.4	6.4			
52	20/5	1000	51°26'	128°35'	203	0	15	25	50	72	100	120	140	150	155	200	203					
						9.6	9.6	8.7	8.6	8.3	8.3	8.2	7.4	6.7	6.2	6.1	6.1					
53	20/5	1255	51°30'	128°33'	175	0	10	20	40	50	95	100	125	140	150	155	175					
						9.7	9.5	9.1	8.5	8.4	8.3	8.2	8.0	6.3	6.2	6.0	6.0					
54	20/5	1505	51°26'	128°29'	193	0	15	20	25	30	50	55	65	100	110	130	150	155	193			
						9.4	9.1	9.3	9.3	9.2	9.0	8.4	8.3	8.3	8.1	7.8	6.5	6.3	6.2			
55	20/5	1620	51°30'	128°31'	190	0	12															
						10.0	9.5															
56	20/5	1655	51°30'	128°31'	190	0	25	30	50	65	100	120	125	150	170	190						
						9.9	9.5	9.1	8.8	8.3	8.3	8.0	8.0	6.0	5.9	5.9						
57	20/5	1830	51°31'	128°56'	47	0	25	47														
						9.8	9.7	9.7														
58	21/5	0900	52°02'	128°49'	170	0	20	22	30	33	50	55	75	100	120	130	150	170				
						9.7	9.5	10.4	9.5	8.9	8.4	8.3	8.4	7.8	7.5	7.1	6.8	6.6				
59	21/5	1130	51°59'	128°47'	164	0	10	25	50	60	75	80	100	125	140	150	164					
						9.7	9.6	10.0	9.3	9.2	9.2	9.6	9.1	8.3	8.6	8.3	8.2					

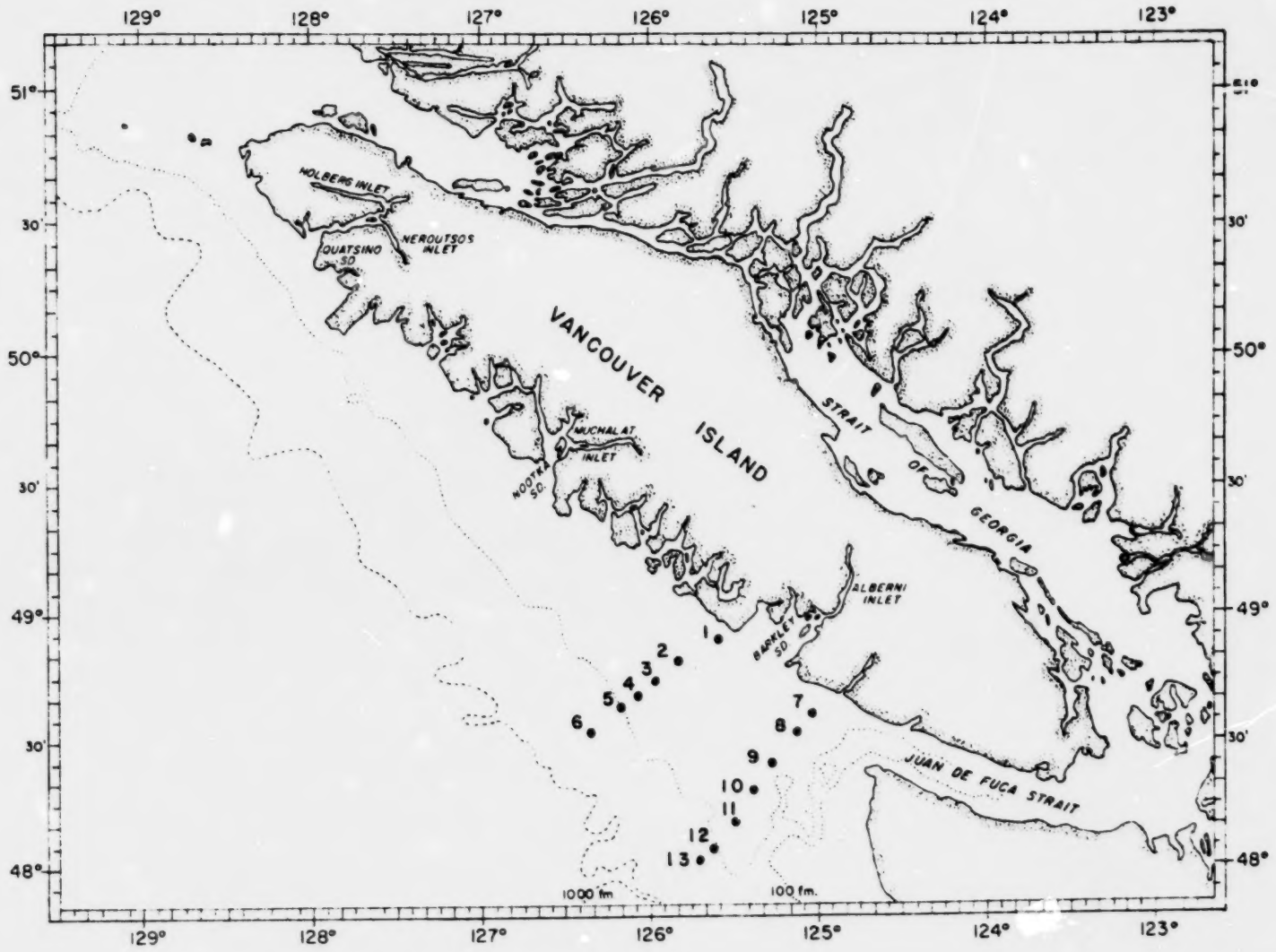

Fig. 3. Station positions, May 6 - June 7, 1980.

Table 3.

AREA: West coast Vancouver Island DATE: May 24-June 7/80 VESSEL: OCEAN KING

No.	Day/Mo.	Time (PST)	Position		Bottom depth (m)	Depth (m)/Temperature (°C)															Depth (m) Salinity (‰)	
			Lat. N	Long. W																		
1	26/5	0150	48°54'	125°35'	95	0	05	10	18	22	30	35	50	60	62	70	85	95				
						11.8	11.8	12.4	11.0	11.4	10.8	11.4	10.3	10.1	10.2	9.7	9.3	9.3				
2	26/5	0830	48°46'	125°51'	73	0	13	17	23	30	50	73										
						11.7	11.6	10.0	9.3	8.9	8.8	8.8										
3	26/5	0922	48°41'	125°59'	98	0	18	25	50	65	90	95	98									
						11.7	11.7	9.8	8.7	8.7	8.1	7.8	7.7									
4	26/5	0950	48°39'	126°04'	126	0	10	15	25	50	75	95	100	105	126							
						11.6	11.4	10.0	9.1	8.8	8.7	8.0	7.8	7.4	7.2							
5	26/5	1029	48°36'	126°09'	188	0	12	20	40	50	62	80	100	105	125	140	150	155	165	188		
						11.9	11.9	9.7	9.0	8.8	8.5	8.2	8.0	7.8	7.5	7.2	7.1	6.8	6.8	6.3		
6	26/5	1129	48°32'	126°20'	460+	0	20	40	50	70	100	103	120	150	200	250	300	350	365	460		
						11.0	10.9	8.5	8.3	8.0	8.0	7.8	7.8	7.3	6.8	6.1	5.7	5.2	5.0	4.9		
7	7/6	1300	48°37'	125°04'	90	0	03	10	25	50	75	80	90									
						10.4	10.0	9.0	8.5	8.2	8.0	7.9	7.6									
8	7/6	1345	48°31'	125°10'	137	0	20	35	50	[illegible]	100	105	120	137								
						11.6	10.0	8.7	8.2	7.7	7.0	6.8	6.7	6.6								
9	7/6	1430	48°24'	125°18'	117	0	02	15	40	50	65	75	100	117								
						11.3	10.0	8.5	8.2	7.6	7.0	7.0	6.7	6.7								
10	7/6	1525	48°18'	125°24'	112	0	20	25	30	50	65	85	90	100	112							
						10.9	9.0	9.0	8.6	8.4	7.8	7.7	7.2	7.2	7.0							
11	7/6	1605	48°12'	125°31'	150	0	15	35	50	65	77	85	95	100	105	125	145	150				
						12.1	10.1	9.6	9.5	9.5	8.0	7.8	7.8	7.5	7.5	7.2	6.8	6.8				
12	7/6	1650	48°06'	125°38'	178	0	10	20	35	45	50	70	85	100	135	150	160	178				
						12.1	10.1	9.6	8.2	8.3	8.3	8.0	8.0	7.7	7.5	7.2	7.0	6.6				
13	7/6	1710	48°04'	125°41'	460+	0	15	33	45	50	75	100	150	200	250	270	300	350	400	460		
						10.2	8.4	8.1	8.2	8.1	7.8	7.5	7.0	6.5	5.8	5.6	5.4	5.2	5.0	4.9		

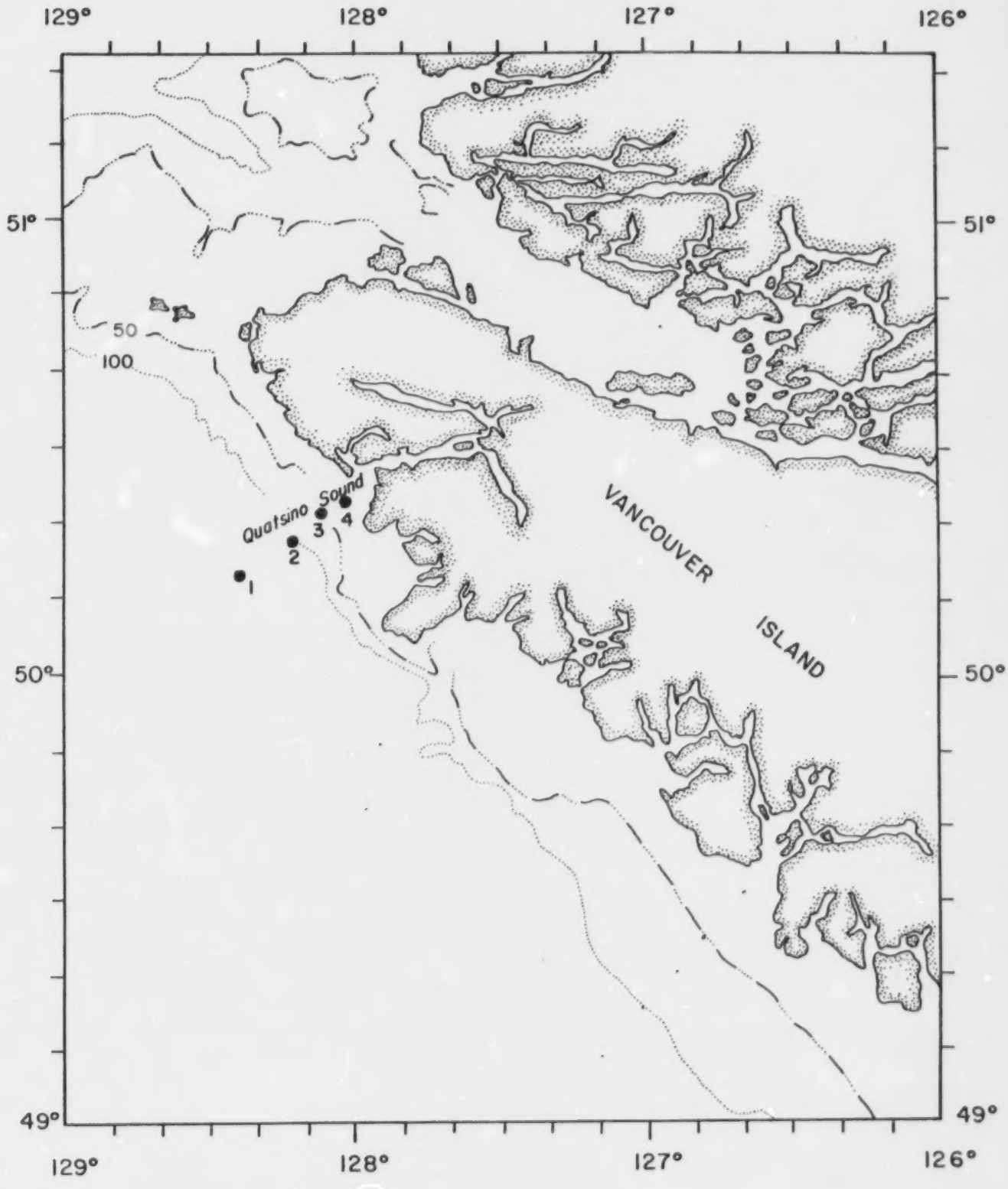

Fig. 4. Station positions, August 8-13, 1980.

Table 4.

AREA: Quatsino Sound DATE: August 8-13, 1980 VESSEL: BLUE WATERS

No.	Day/Mo.	Time (PST)	Position		Bottom depth (m)	Depth (m)/Temperature (°C)														Depth (m) Salinity (‰)	
			Lat. N	Long. W																	
1	8/8	1927	50°13'	128°22'	460+	0	10	20	30	50	75	100	125	150	200	250	300	400	460	0	
						12.2	10.3	9.2	8.7	8.2	7.8	7.3	7.0	6.6	6.2	6.1	5.7	5.3	5.1	32.331	
2	12/8	2017	50°18'	128°13'	286	0	10	22	32	50	75	100	125	150	175	200	220	250	286	0	
						12.5	10.7	10.0	9.1	8.4	7.7	7.3	7.1	6.6	6.4	6.1	6.0	5.9	5.6	32.040	
3	12/8	2157	50°22'	128°07'	93	0	10	25	50	75	93									0	
						12.7	10.0	8.8	8.3	8.2	8.0									32.339	
4	13/8	2358	50°24'	128°02'	192	0	10	15	20	25	50	70	90	100	110	125	150	192		0	
						12.8	9.5	9.5	9.0	9.0	8.3	8.0	8.0	7.8	7.5	7.4	7.3	7.2		32.424	

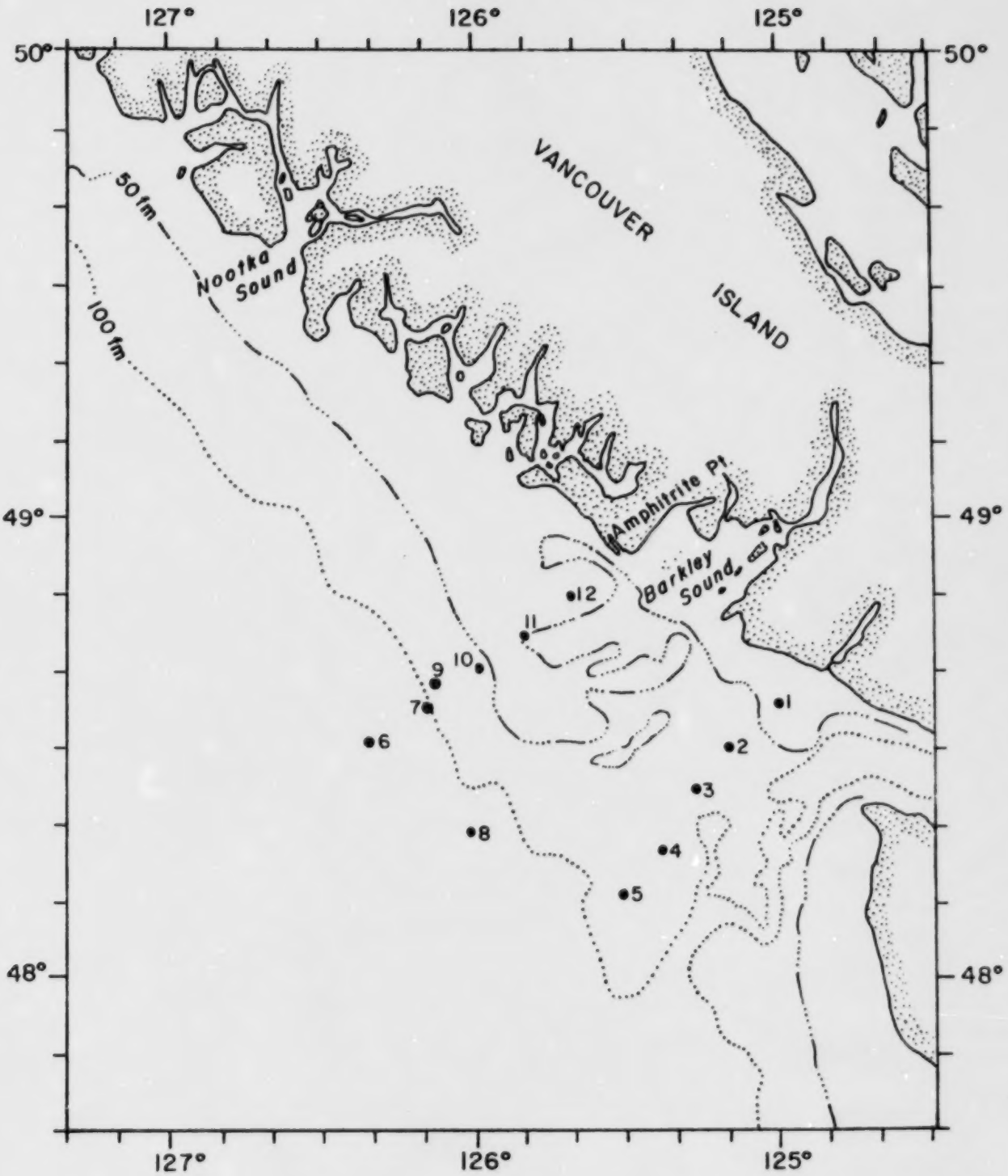

Fig. 5. Station positions, February 1-3, 1981.

Table 5.

AREA: Southwest Vancouver Island DATE: February 1-3, 1981 VESSEL: ARCTIC HARVESTER

No.	Day/Mo.	Time (PST)	Position		Bottom depth (m)	Depth (m)/Temperature (°C)																Depth (m) Salinity (‰)	
			Lat. N	Long. W																			
1	01/02	0930	48°37'	125°04'	85	0	02	10	20	40	45	50	70	80	85								
						9.0	8.8	8.7	8.9	9.0	9.3	9.3	10.1	10.2	10.1								
2	01/02	1020	48°31'	125°11'	123	0	05	10	25	50	53	83	100	120	123								
						10.0	9.9	10.3	10.7	10.8	11.0	11.2	10.7	10.1	9.6								
3	01/02	1115	48°24'	125°17'	120	0	03	08	10	20	30	35	52	55	70	75	100	103	115	120			
						10.3	10.3	10.3	10.8	11.8	11.5	11.3	11.3	11.5	11.2	11.5	11.0	10.5	10.3	9.8			
4	01/02	1155	48°18'	125°24'	106	0	03	30	35	50	53	90	92	100	106								
						10.5	10.5	10.5	10.8	11.0	11.2	11.0	11.3	11.2	10.8								
5	01/02	1225	48°12'	125°31'	152	0	05	33	35	50	55	80	95	100	103	115	120	140	150	152			
						10.8	10.8	10.8	10.9	11.0	11.1	11.1	11.0	10.7	10.4	10.2	9.9	9.8	8.8	8.5			
6	02/02	1050	48°32'	126°20'	460+	0	15	20	35	50	70	80	100	150	200	300	350	400	460				
						10.4	10.3	10.5	10.4	10.6	11.0	10.7	10.3	9.0	8.2	7.1	6.5	6.0	5.5				
7	02/02	1145	48°36'	126°09'	183	0	50	60	72	83	85	100	115	125	150	183							
						10.3	10.2	10.2	10.7	10.7	10.3	10.0	9.2	9.0	8.8	8.2							
8	02/02	1410	48°19'	126°08'	272	0	02	50	60	65	75	100	115	150	175	200	250	272					
						10.8	10.8	10.8	10.9	10.9	10.0	9.6	9.0	8.2	8.0	7.8	7.4	7.5					
9	03/02	0020	48°39'	126°09'	113	0	30	40	60	75	80	92	100	113									
						10.0	10.0	10.3	10.3	10.7	10.5	10.5	10.0	9.5									
10	03/02	0045	48°41'	125°59'	98	0	13	20	35	40	50	55	62	88	98								
						9.6	9.6	9.9	10.0	9.9	10.3	10.1	10.5	10.5	10.1								
11	03/02	0135	48°46'	125°51'	65	0	10	13	40	50	65												
						9.5	9.5	10.0	10.3	10.4	10.4												
12	03/02	0210	48°50'	125°42'	25	0	1	15	22	25													
						9.5	9.0	9.0	9.2	9.0													

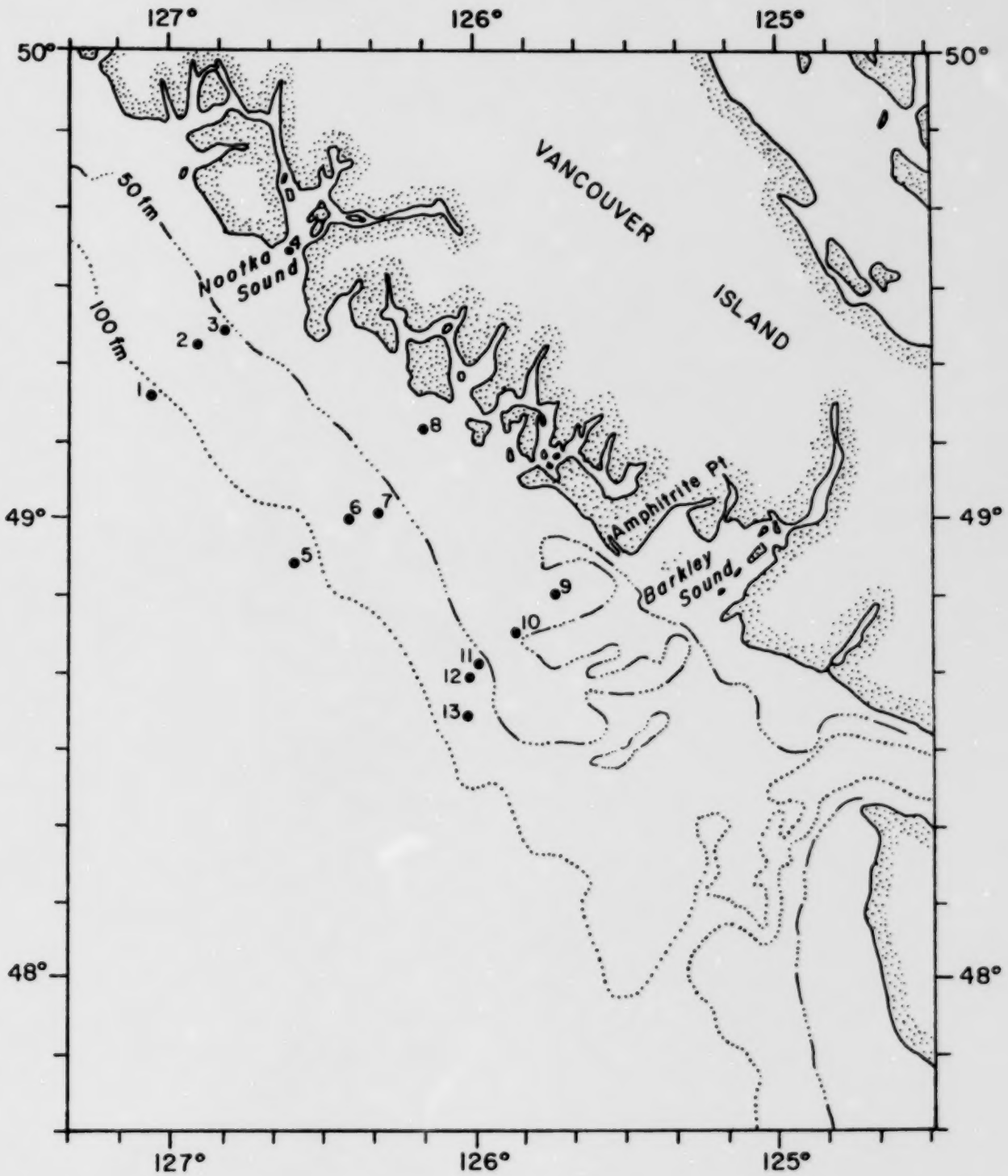

Fig. 6. Station positions, March 8-14, 1981.

Table 6.

AREA: West Coast Vancouver Island DATE: March 8-14, 1981 VESSEL: ARCTIC HARVESTER

No.	Day/Mo.	Time (PST)	Position		Bottom depth (m)	Depth (m)/Temperature (°C)															Depth (m) Salinity (‰)	
			Lat. N	Long. W																		
1	08/03	1510	49°16'	127°02'	163	0	02	25	50	75	80	90	92	100	115	125	150	158	163			
						9.8	9.6	9.6	9.5	9.3	9.5	9.1	9.3	9.0	8.9	8.5	7.8	7.5	7.5			
2	08/03	1545	49°21'	126°55'	148	0	30	50	60	75	82	100	105	125	148							
						9.4	9.4	9.5	9.6	9.6	9.4	9.7	9.5	8.5	8.0							
3	08/03	1615	49°26'	126°49'	105	0	20	30	50	75	100	105										
						9.6	9.6	9.7	9.8	9.8	9.8	9.8										
4	08/03	1715	49°34'	126°38'	58	0	02	25	30	50	58											
						9.2	9.0	9.0	9.1	9.8	9.7											
5	13/03	2135	48°55'	126°32'	170	0	20	25	40	42	70	90	100	125	140	150	170					
						9.9	10.0	10.0	10.2	10.1	10.1	10.2	10.1	9.8	8.6	8.2	7.6					
6	13/03	2130	49°00'	126°25'	-	0	10	20	25	50	73	80	98	100	120	140						
						9.8	10.1	10.0	10.0	9.9	9.8	10.0	10.0	9.8	9.0	8.0						
7	13/03	2205	49°05'	126°19'	98	0	25	30	50	55	75	90	98									
						10.0	10.0	9.7	9.9	10.1	9.8	9.6	9.4									
8	13/03	2250	49°11'	126°10'	18	0	08	10	18													
						9.6	9.6	9.4	9.4													
9	14/03	0115	48°50'	125°42'	56	0	15	25	40	50	56											
						9.1	9.1	8.8	9.0	9.2	9.3											
10	14/03	-	48°46'	125°51'	45	0	20	30	40	45												
						9.4	9.4	10.0	10.1	10.2												
11	14/03	0250	48°41'	125°59'	95	0	10	25	30	33	50	60	70	75	95							
						9.6	9.7	9.9	10.0	9.9	10.2	10.5	10.5	10.4	9.9							
12	14/03	0325	48°39'	126°04'	183	0	10	25	30	40	50	75	90	100	160	170	183					
						10.4	10.3	10.3	10.1	9.8	9.7	9.5	9.3	9.5	8.8	8.5	8.2					
13	14/03	0400	48°36'	126°09'	260	0	15	25	40	50	75	80	100	110	125	150	180	200	250	260		
						10.2	10.1	9.9	10.0	10.1	10.2	10.1	8.7	8.7	8.2	7.6	7.0	7.0	7.5	7.4		

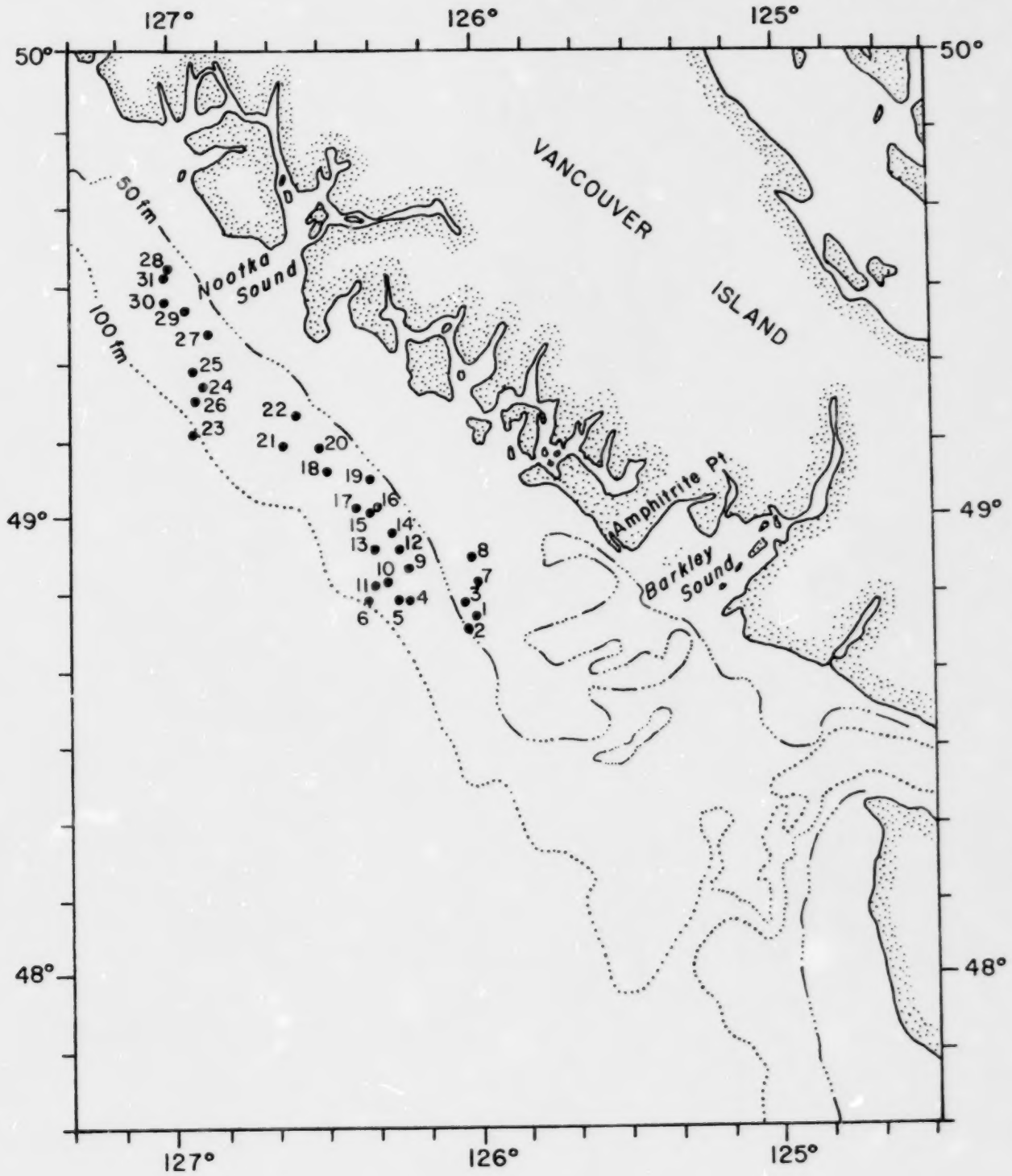

Fig. 7a. Station positions, May 6-20, 1981.

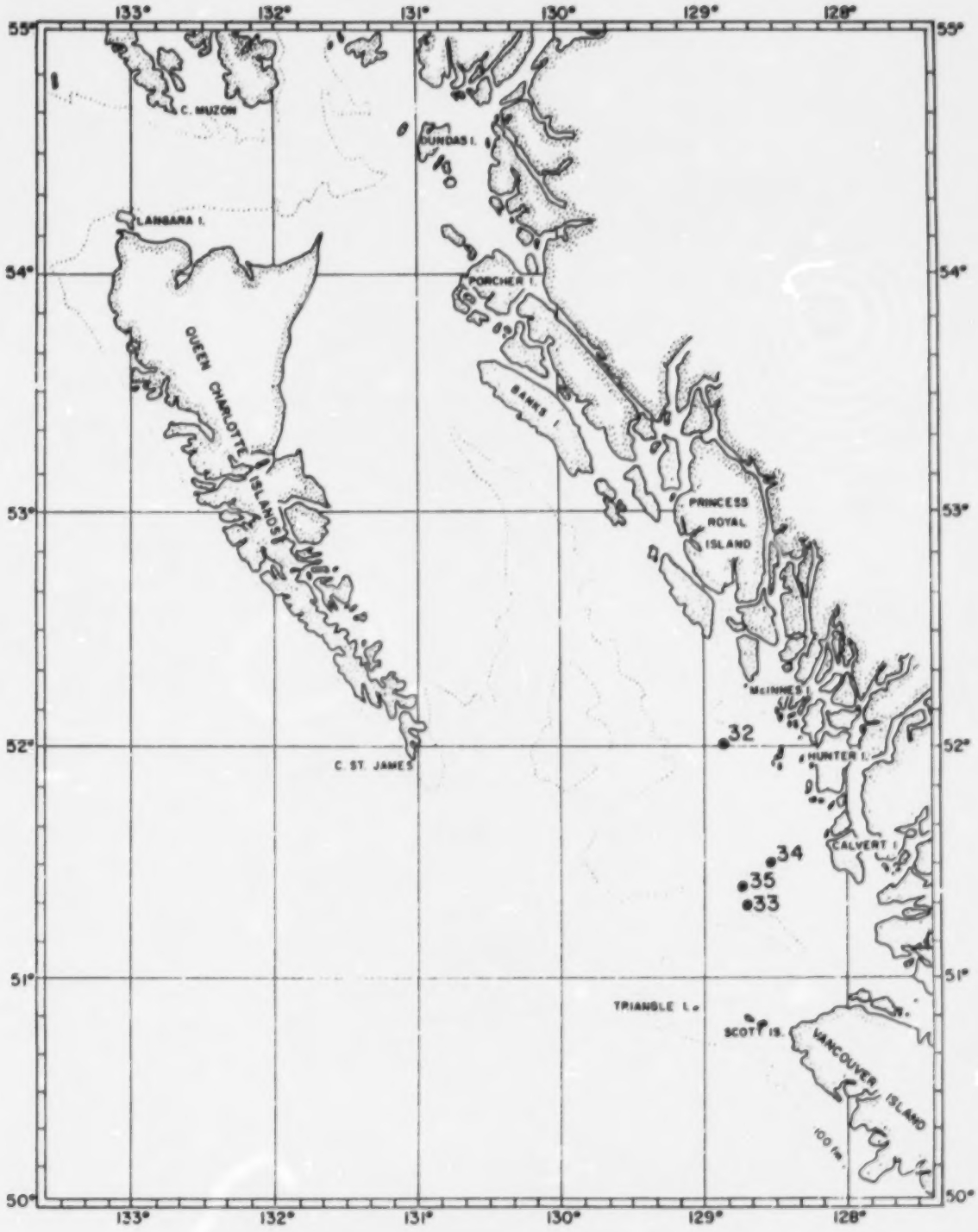

Fig. 7b. Station positions, May 6-20, 1981.

Table 7.

AREA: West Coast of Vancouver Island DATE: May 6-20, 1981 VESSEL: C.S. REED Page 1

No.	Day/Mo.	Time (PST)	Position		Bottom depth (m)	Depth (m)/Temperature (°C)																Depth (m) Salinity (‰)	
			Lat. N	Long. W																			
1	06/05	0850	48°47'	126°03'	90	0	05	10	18	25	30	50	75	85	90								
						10.7	10.5	10.4	10.4	10.0	10.0	9.0	8.9	8.8	8.3								
2	06/05	1210	48°45'	126°08'	128	0	05	10	15	25	35	50	55	60	85	100	110	128					
						10.7	10.6	10.6	9.6	10.3	9.7	9.6	10.0	9.0	8.8	7.9	7.8	7.5					
3	06/05	1605	48°49'	126°07'	105	0	05	10	15	20	35	40	50	55	87	95	100	105					
						10.6	10.5	10.5	10.4	10.0	10.0	9.0	8.9	8.8	8.7	8.1	8.1	8.1					
4	07/05	1045	48°49'	126°15'	152	0	05	10	25	40	45	50	62	80	100	115	128	152					
						10.4	10.3	10.6	10.5	10.5	9.6	9.7	9.4	9.2	8.5	8.2	7.4	7.4					
5	07/05	1245	48°49'	126°17'	165	0	05	10	18	25	32	40	65	75	100	125	140	150	165				
						10.5	10.5	10.4	10.4	10.1	10.1	9.6	9.5	8.8	8.2	7.6	7.0	7.0	6.9				
6	07/05	1453	48°49'	126°21'	180	0	10	20	30	50	70	85	95	100	110	113	150	173	180				
						10.5	10.5	10.3	9.7	9.2	8.9	8.1	8.2	8.8	8.5	8.7	8.7	8.7	8.3				
7	07/05	1923	48°51'	126°08'	105	0	05	10	20	30	33	40	50	70	75	90	100	105					
						10.5	10.5	10.5	10.3	10.2	10.2	9.0	9.0	8.8	8.9	7.9	7.9	7.9					
8	08/05	0900	48°55'	126°08'	91	0	05	10	15	25	32	50	60	72	80	88	91						
						10.4	10.4	10.4	9.3	9.4	9.1	9.1	9.2	9.1	8.0	7.8	7.8						
9	08/05	1145	48°53'	126°14'	125	0	05	10	32	40	50	63	75	77	100	120	125						
						10.4	10.4	10.4	10.4	9.2	9.2	9.2	9.0	9.0	8.2	7.4	7.4						
10	08/05	1500	48°52'	126°18'	152	0	05	10	25	30	50	75	100	130	150	152							
						10.3	10.3	10.3	10.3	9.9	9.5	9.0	8.2	7.5	7.2	7.1							
11	08/05	1700	48°51'	126°20'	164	0	05	10	25	28	30	50	75	100	125	130	150	164					
						10.3	10.3	10.3	10.3	10.0	9.8	9.4	8.7	8.0	7.7	7.2	7.0	7.0					
12	09/05	0825	48°56'	126°15'	123	0	05	10	15	20	22	31	40	50	60	75	100	110	123				
						10.3	10.2	10.3	10.2	9.3	9.1	9.6	9.4	9.3	9.1	8.7	8.2	7.5	7.2				
13	09/05	1125	48°56'	126°20'	140	0	05	10	30	33	40	50	60	75	80	90	100	125	130	140			
						10.4	10.4	10.4	10.4	9.3	9.6	9.4	9.5	9.2	9.2	8.5	8.3	7.5	7.2	7.2			
14	10/05	0815	48°58'	126°17'	126	0	05	10	20	25	30	50	65	75	100	110	126						
						10.6	10.6	10.5	10.3	10.0	9.8	9.4	9.0	8.7	7.7	7.3	7.3						
15	10/05	1230	49°01'	126°21'	128	0	05	8	18	20	30	50	65	75	100	110	125	128					
						10.5	10.5	10.3	10.3	10.6	10.0	9.7	9.4	9.1	8.2	7.9	7.4	7.4					

Table 7 (cont'd)

AREA: West Coast of Vancouver Island DATE: May 6-20, 1981 VESSEL: G.B.REED

No.	Day/Mo.	Time (PST)	Position		Bottom depth (m)	Depth (m)/Temperature (°C)																Depth (m) Salinity (‰)									
			Lat. N	Long. W																											
16	11/05	0830	49°02'	126°20'	119	0	05	10	15	20	25	32	40	50	70	75	80	100	119												
						10.7	10.7	10.7	10.5	10.7	10.5	9.8	10.2	10.0	9.1	9.1	8.8	8.0	7.7												
17	11/05	1125	49°02'	126°24'	140	0	05	10	20	32	50	75	100	112	128	140															
						10.7	10.7	10.5	10.3	10.2	9.6	9.1	8.4	7.6	7.5	6.8															
18	11/05	1645	49°06'	126°30'	130	0	05	10	20	30	40	50	60	75	83	100	105	120	130												
						10.5	10.5	10.5	10.4	10.3	10.2	10.0	9.4	9.0	8.5	8.0	7.7	7.5	7.5												
19	12/05	0820	49°05'	126°21'	102	0	05	10	18	20	30	50	75	86	100	102															
						10.8	10.8	10.3	10.3	11.7	10.5	9.9	9.2	8.2	8.2	8.2															
20	12/05	1245	49°09'	126°32'	123	0	05	10	15	33	50	57	70	80	90	100	108	123													
						11.2	10.9	10.2	10.0	9.9	9.4	9.1	9.0	8.6	8.1	7.9	7.5	7.5													
21	12/05	1855	49°09'	126°38'	126	0	05	07	10	25	40	50	63	75	90	100	123	126													
						11.0	11.0	11.0	10.5	10.3	9.6	9.5	9.0	9.0	8.5	8.0	7.8	7.7													
22	13/05	1140	49°13'	126°36'	108	0	05	08	10	15	25	40	50	75	100	108															
						11.5	11.5	11.5	11.3	10.5	10.2	9.9	9.7	8.1	7.5	7.5															
23	13/05	1425	49°11'	126°56'	191	0	05	10	20	30	50	62	75	82	100	122	150	155	170	191											
						11.0	10.8	10.7	10.4	10.0	9.5	9.1	9.1	9.1	8.2	8.1	7.2	7.0	7.0	6.5										
24	14/05	0710	49°17'	126°54'	144	0	05	07	10	17	28	50	63	75	100	112	120	125	144												
						11.4	11.4	11.4	11.0	10.1	10.1	9.1	9.0	8.5	8.1	7.8	7.2	7.0	6.7												
25	14/05	1115	49°19'	126°56'	150	0	05	10	15	25	35	50	75	81	100	125	134	137	150												
						11.2	11.2	11.2	10.3	10.0	10.0	9.2	8.2	8.0	7.9	7.5	7.3	7.0	7.0												
26	14/05	1700	49°15'	126°55'	160	0	05	10	15	25	30	40	50	55	80	100	120	130	140	160											
						11.8	11.5	11.3	10.4	10.4	10.0	9.9	9.6	9.2	8.5	8.1	8.0	7.8	7.0	6.5										
27	15/05	0730	49°24'	126°53'	127	0	05	10	20	30	40	50	65	75	82	100	112	113	127												
						11.5	11.3	11.0	10.0	9.8	9.8	9.4	9.0	8.5	8.1	7.8	7.7	7.4	7.4												
28	15/05	1125	49°32'	127°00'	135	0	05	10	25	32	50	65	83	93	100	104	105	125	135												
						11.8	11.5	10.3	10.0	9.4	9.1	8.0	7.5	7.1	7.0	7.0	6.8	6.8	6.7											
29	16/05	0742	49°27'	126°57'	115	0	05	10	15	20	28	34	50	65	75	77	90	100	115												
						11.1	11.0	11.0	11.0	10.2	10.2	9.3	9.0	8.8	7.9	7.3	7.0	6.8	6.8											
30	16/05	1240	49°28'	127°05'	139	0	05	12	20	25	42	50	58	65	75	100	110	139													
						11.2	11.2	11.2	10.3	9.9	9.5	9.5	9.4	8.7	8.5	7.0	6.5	6.5													

Table 7 (cont'd)

AREA: West Coast of Vancouver Island DATE: May 6-20, 1981 VESSEL: G.B. REED Page 3

No.	Day/Mo.	Time (PST)	Position		Bottom depth (m)	Depth (m)/Temperature (°C)																
			Lat. N	Long. W																		
31	18/05	0710	49°31'	127°07'	138	0	05	10	12	30	40	50	70	90	95	100	115	118	138			
						10.8	10.7	10.6	10.5	10.5	9.7	9.3	9.0	7.9	7.2	7.2	7.0	6.7	6.6			
32	19/05	0720	52°04'	128°53'	168	0	05	18	27	32	50	65	75	90	100	109	120	135	150	157	160	168
						10.2	10.2	10.2	9.7	9.3	9.3	8.8	8.8	8.3	8.3	8.3	7.4	7.3	7.0	7.0	6.7	6.7
33	19/05	1245	51°18'	128°43'	152	0	05	15	20	25	50	60	75	93	100	125	130	152				
						10.1	10.1	10.0	9.5	9.3	9.2	8.9	8.7	8.6	8.2	7.3	7.0	6.9				
34	20/05	0715	51°30'	128°33'	183	0	05	12	15	30	40	50	75	100	115	118	120	150	158	183		
						10.0	10.0	10.0	9.7	10.2	10.0	9.5	9.3	9.0	8.3	8.8	8.3	6.9	6.5	6.5		
35	20/05	1255	51°23'	128°45'	206	0	05	10	18	30	50	75	100	125	150	165	180	200	206			
						10.6	10.5	10.6	10.0	10.0	9.5	9.3	9.0	8.6	7.8	7.5	6.2	6.2	6.2			

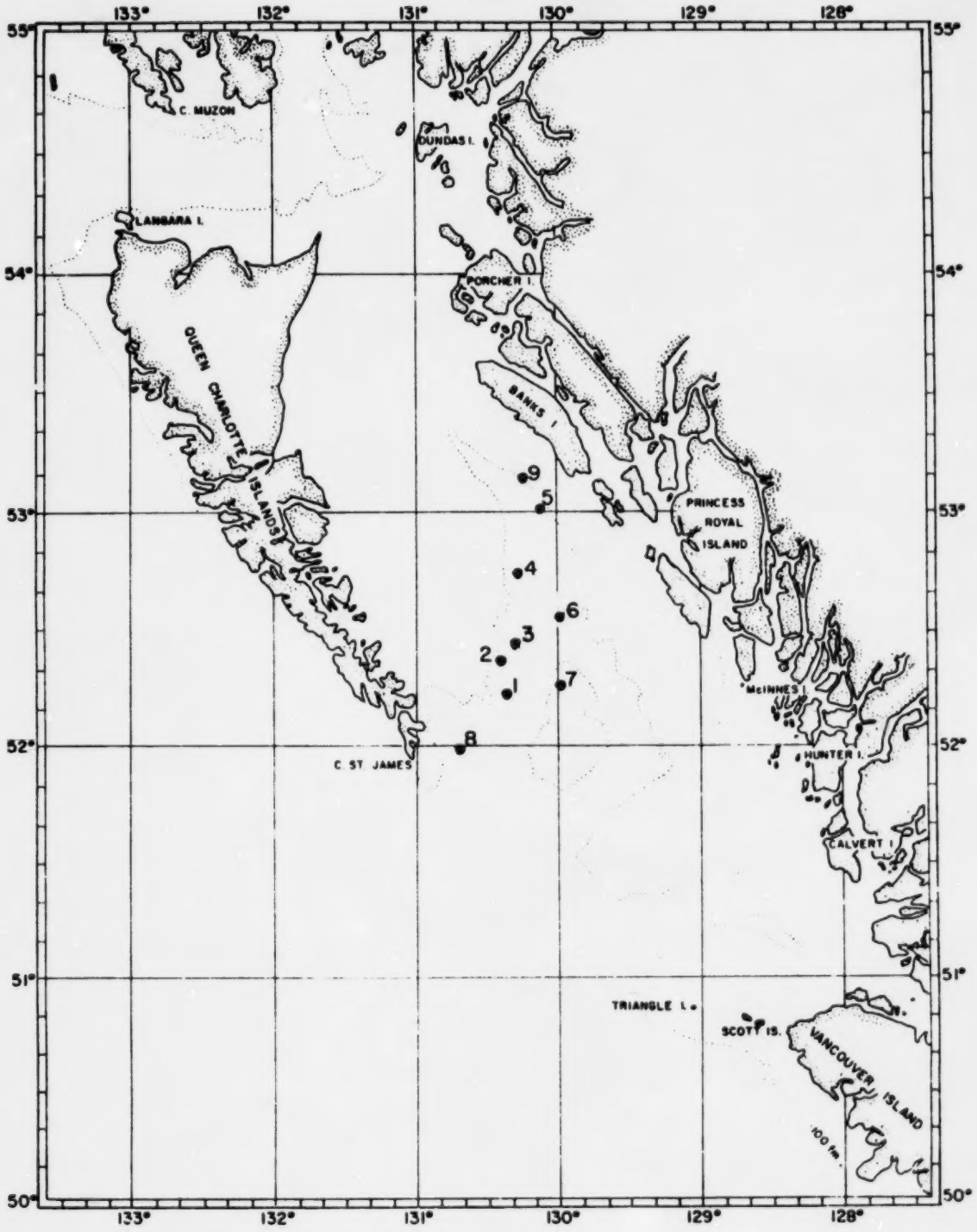

Fig. 8. Station positions, June 7-16, 1981.

Table 8.

AREA: Hecate Strait DATE: June 7-16, 1981 VESSEL: TENACIOUS

No.	Day/Mo.	Time (PST)	Position		Bottom depth (m)	Depth (m)/Temperature (°C)															Depth (m) Salinity (‰)	
			Lat. N	Long. W																		
1	07/06	1014	52°16'	130°23'	304	0	02	20	25	50	63	100	125	150	175	200	225	250	253	304		
						11.1	10.8	10.6	10.7	10.0	8.9	8.3	7.6	6.9	6.6	6.4	6.0	6.0	5.9	5.7		
2	07/06	1820	52°22'	130°29'	170	0	05	25	50	75	100	125	150	170								
						12.6	10.7	10.4	9.0	7.9	8.4	6.8	6.5	6.2								
3	08/06	1025	52°25'	130°21'	-	0	05	10	15													
						11.2	11.2	10.7	10.5													
4	10/06	0855	52°47'	130°21'	193	0	05	15	28	40	50	75	100	125	150	175	193					
						11.6	11.5	10.6	10.6	8.9	8.8	8.0	8.8	7.1	6.4	6.0	6.9					
5	10/06	1800	53°05'	130°11'	-	0	05	10														
						11.7	10.7	10.1														
6	12/06	1340	52°36'	130°03'	271	0	10	25	50	60	75	100	125	150	175	200	215	250	271			
						12.9	12.0	10.5	9.2	8.7	8.5	7.9	7.0	6.8	6.5	6.2	5.7	5.6	5.5			
7	14/06	0925	52°17'	130°04'	240	0	05	15	50	75	100	125	150	175	200	240						
						13.5	12.5	11.0	9.8	9.2	8.5	7.6	6.7	6.3	6.1	5.9						
8	15/06	1620	51°59'	130°43'	296	0	10	15	20	45	50	75	100	125	150	200	250	296				
						11.6	11.3	11.6	11.3	9.4	9.7	8.1	7.6	6.8	6.5	6.2	5.7	5.7				
9	16/06	1420	53°10'	130°17'	-	0	25	40	50	60	75	100	125	150	175	200	212					
						11.9	11.8	10.0	10.3	10.0	9.6	8.6	7.6	6.8	6.3	6.2	6.1					

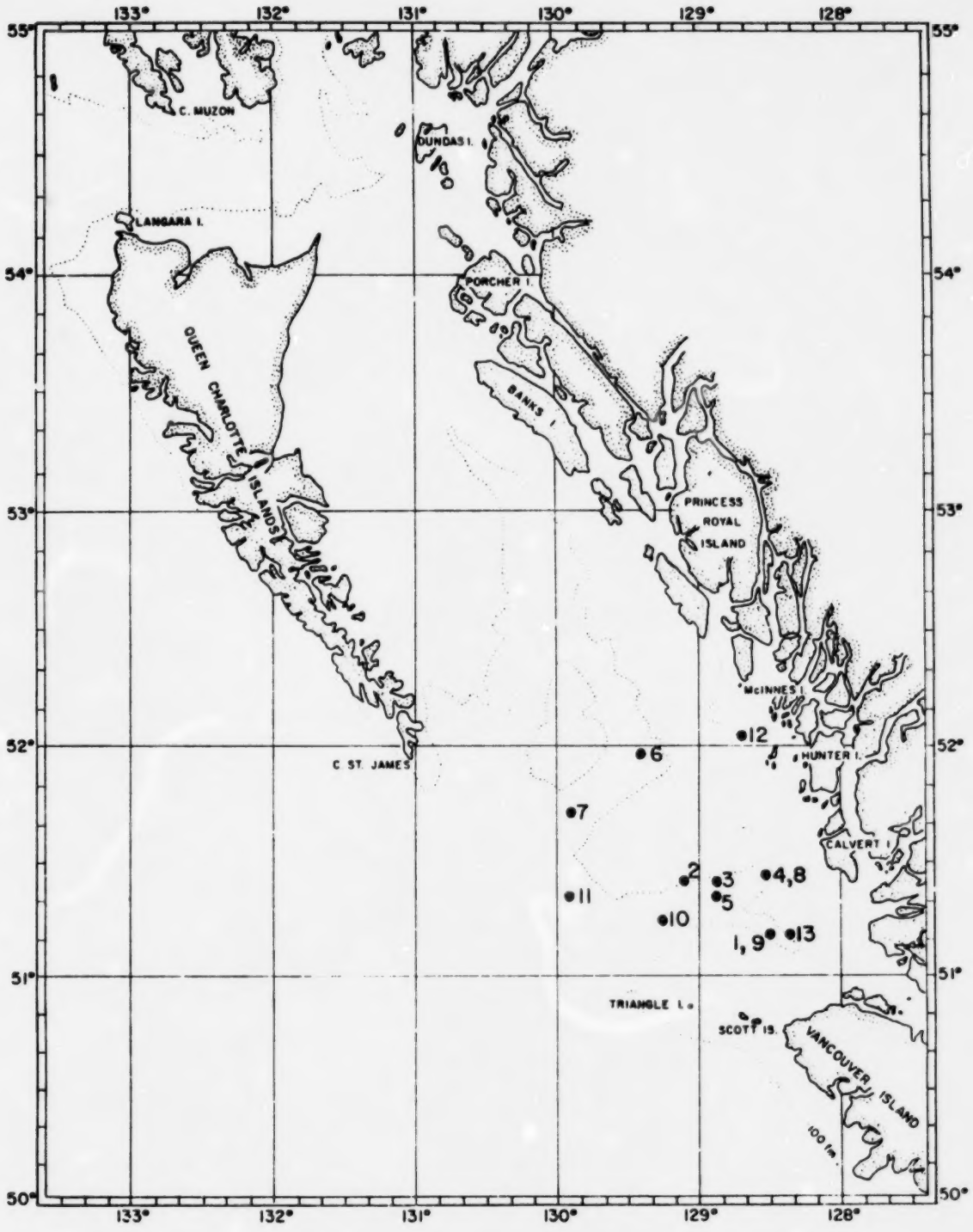

Fig. 9. Station positions, July 5-16, 1981.

Table 9.

AREA: Queen Charlotte Sound DATE: July 5-16, 1981 VESSEL: G.B. REED

No.	Day/Mo.	Time (PST)	Position		Bottom depth (m)	Depth (m)/Temperature (°C)															Depth (m) Salinity (‰)	
			Lat. N	Long. W																		
1	05/07	0932	51°12'	128°30'	198	0	05	10	25	50	55	75	100	110	150	160	175	198				
						13.2	13.1	12.8	12.0	10.0	9.4	9.0	7.0	6.7	6.7	6.4	6.2	6.2				
2	06/07	0845	51°27'	129°06'	83	0	05	15	25	30	50	60	75	83								
						12.7	12.7	12.2	12.2	11.8	11.0	10.0	9.4	8.8								
3	07/07	0525	51°26'	128°53'	190	0	05	20	30	50	75	92	100	110	125	150	175	185	190			
						13.2	13.2	12.5	12.5	11.0	9.5	8.9	8.9	8.9	8.2	7.6	7.2	7.0	6.2			
4	07/07	2332	51°27'	128°32'	226	0	05	10	15	25	50	75	100	125	150	175	200	226				
						13.4	13.4	13.0	11.6	11.3	10.0	8.8	8.3	7.8	7.0	5.8	5.8	5.8				
5	08/07	0215	51°22'	128°52'	258	0	05	15	25	50	60	75	100	125	150	175	200	225	250	258		
						13.3	13.3	13.0	12.0	10.5	10.0	9.6	8.7	7.2	6.6	6.3	6.1	5.8	5.7	5.7		
6	08/07	2315	51°58'	129°22'	218	0	05	30	40	50	58	75	100	125	150	175	196	218				
						12.7	12.6	12.6	12.0	11.0	10.0	9.0	8.5	7.5	7.2	6.7	6.3	6.2				
7	09/07	0143	51°43'	129°52'	336	0	05	15	25	50	60	75	100	125	150	162	200	250	300	336		
						12.7	12.7	12.8	12.8	10.6	10.7	9.3	8.6	7.2	6.9	6.3	6.2	5.9	5.6	5.1		
8	09/07	2250	51°27'	128°32'	208	0	05	25	40	50	58	75	100	125	150	164	200	208				
						13.2	13.2	12.5	12.0	11.2	10.0	9.0	8.3	7.4	6.5	5.7	5.7	5.7				
9	10/07	0052	51°12'	128°30'	200	0	05	15	25	30	50	75	100	125	150	156	175	200				
						13.2	13.2	13.2	12.6	12.5	11.1	8.9	7.1	6.7	6.3	6.1	6.0	6.0				
10	10/07	1833	51°16'	129°14'	277	0	05	25	50	75	100	125	150	175	200	227	250	277				
						13.6	13.5	12.5	10.5	8.2	7.2	6.5	6.2	6.1	5.9	5.7	5.7	5.7				
11	10/07	2229	51°21'	129°54'	247	0	05	15	25	50	75	100	125	150	175	200	225	247				
						13.2	13.2	13.0	11.6	10.0	9.0	7.7	6.6	6.1	5.9	5.7	5.5	5.5				
12	14/07	0942	52°02'	128°41'	172	0	05	10	15	25	35	50	75	100	125	150	172					
						14.2	13.0	11.6	12.6	10.0	11.1	10.0	8.5	7.5	6.7	6.2	6.2					
13	16/07	1420	51°12'	128°21'	164	0	05	10	25	50	75	100	125	150	155	164						
						14.0	13.9	13.9	12.3	9.6	8.6	8.0	7.6	6.5	6.5	6.3						

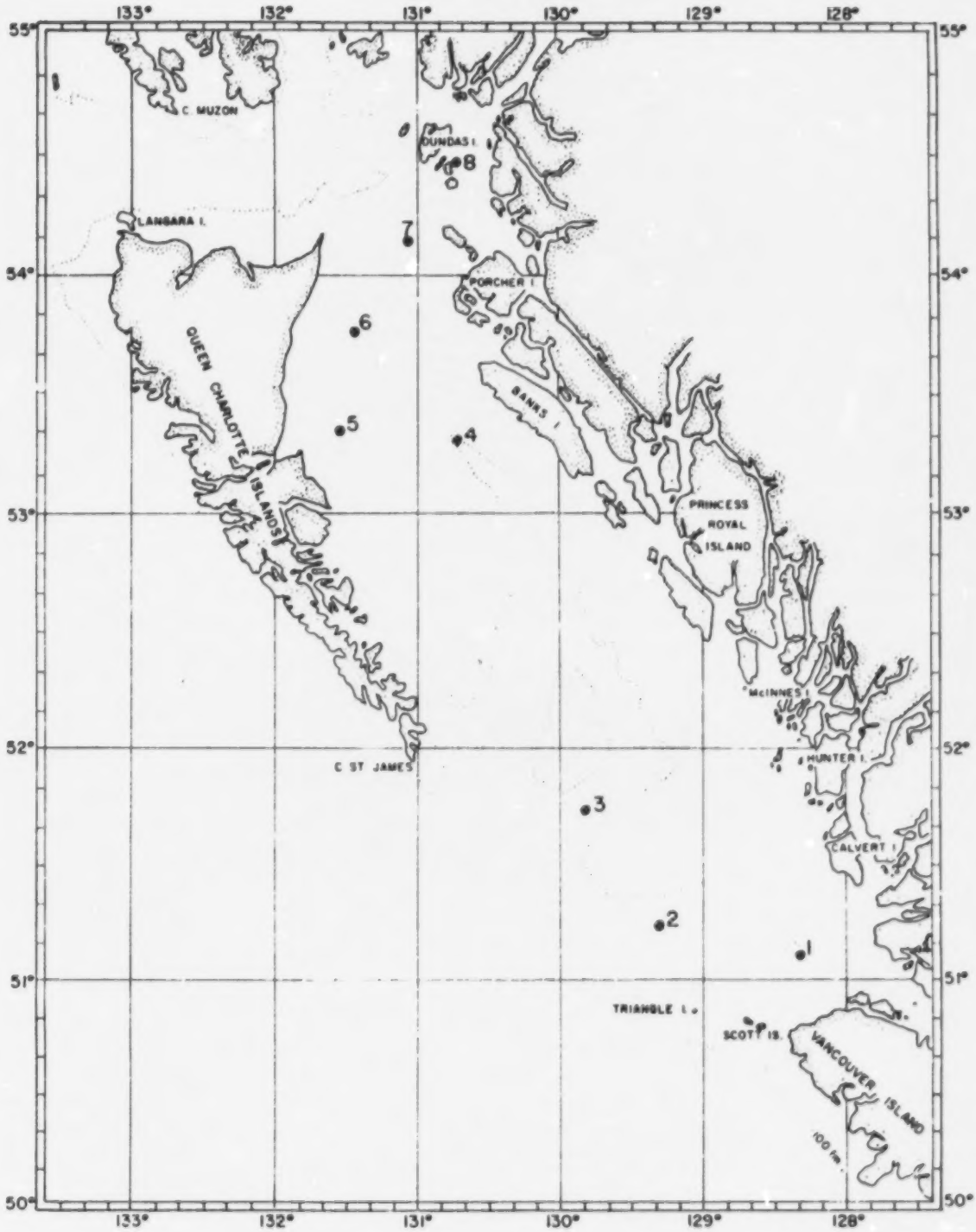

Fig. 10. Station positions, August 7-18, 1981.

Table 10.

No.	Day/Mo.	(PST)	Lat. N	Long. W	Bottom depth (m)	Depth (m)/Temperature (°C)													
1	07/08	1220	51°07'	128°21'	183	0 15.0	05 14.3	10 14.0	20 11.1	25 10.8	35 10.2	50 9.4	60 9.3	75 8.0	100 6.9	123 6.3	150 6.2	183 6.2	
2	07/08	1840	51°13'	129°17'	286	0 16.0	02 15.4	20 15.2	25 15.0	35 11.8	50 10.7	75 8.3	85 7.5	100 7.1	120 6.7	150 6.5	175 6.4	200 6.2	250 286 5.7 5.7
3	07/08	1140	51°43'	129°50'	319	0 15.0	02 14.8	15 14.7	25 12.5	50 10.3	75 8.9	100 8.2	125 6.8	150 6.5	175 6.1	200 6.0	220 6.0	250 5.8	300 319 5.5 5.3
4	11/08	0630	53°20'	130°46'	-	0 12.9	05 12.7	10 12.8	20 12.7	25 10.8	43 10.3	50 9.0	75 8.3	90 7.1	100 7.0	125 6.4	150 5.8	160 5.7	183 5.7
5	13/08	1210	53°21'	131°36'	25	0 16.8	03 16.5	10 16.4	20 16.3	25 16.2									
6	14/08	1900	53°48'	131°27'	17	0 13.8	05 13.2	17 13.2											
7	16/08	1638	54°09'	131°05'	110	0 12.0	05 11.6	20 11.2	25 10.8	30 10.5	40 10.3	50 8.5	75 6.9	100 6.8	110 6.8				
8	18/08	2046	54°29'	130°45'	-	0 14.1	10 14.0	25 10.5	33 8.8	50 8.3	75 7.3	100 7.1	125 6.6	150 6.4	175 6.2	200 6.0			

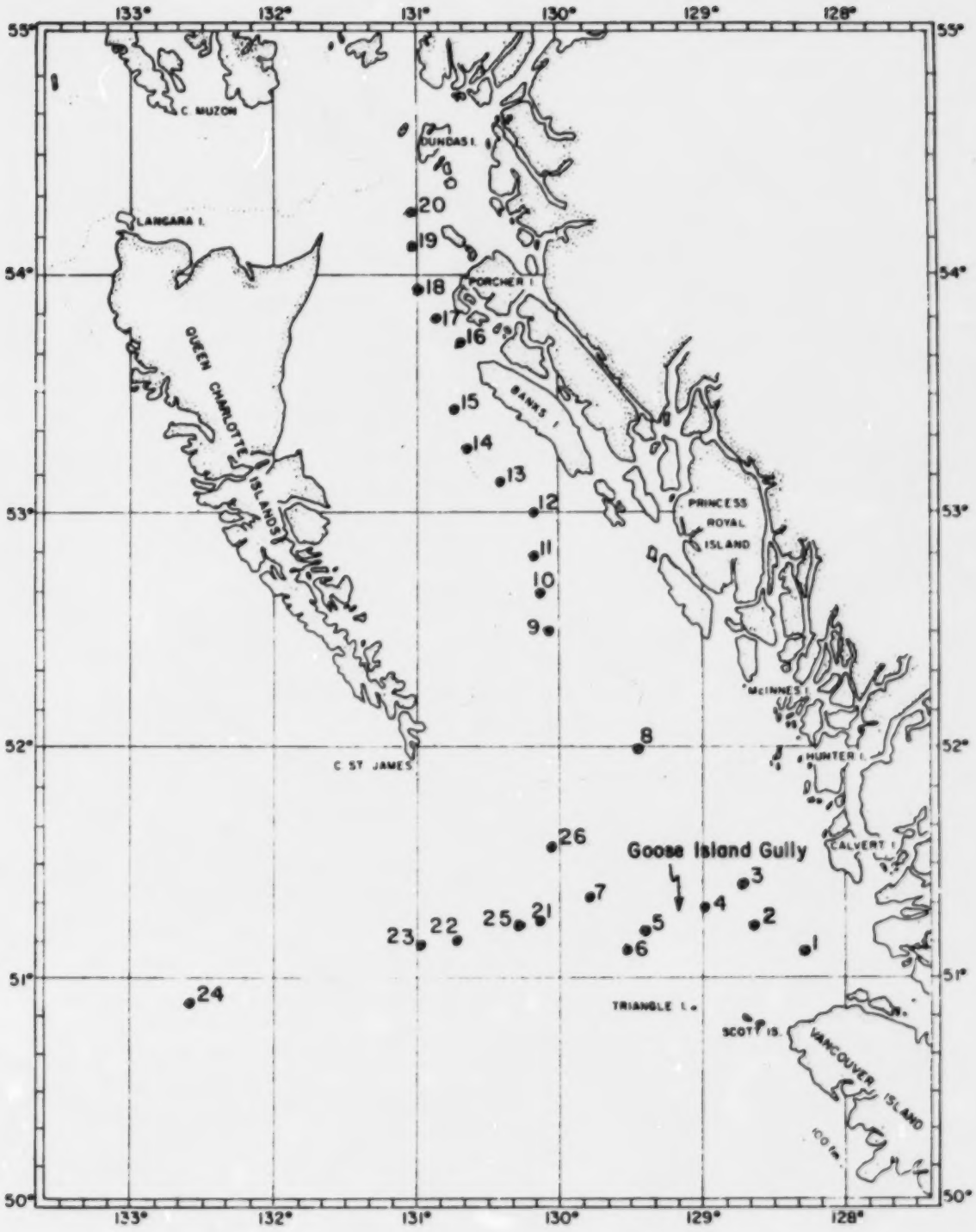

Fig. 11. Station positions, August 12-25, 1981.

Table 11.

AREA: Queen Charlotte Sound/Hecate Strait DATE: August 12-25, 1981 VESSEL: G. B. REED

No.	Day/Mo.	Time (PST)	Position		Bottom depth (m)	Depth (m)/Temperature (°C)															Depth (m) Salinity (‰)	
			Lat. N	Long. W																		
1	12/08	0900	51°07'	128°20'	181	0	05	25	50	75	90	100	115	130	150	181						
						12.2	12.1	10.2	8.8	7.3	6.4	6.3	6.2	6.0	5.8	5.8						
2	12/08	1100	51°15'	128°40'	191	0	15	20	25	50	75	100	105	125	138	150	162	191				
						14.6	14.5	11.3	10.8	9.1	8.3	6.8	6.6	6.5	6.3	6.3	6.1	6.0				
3	12/08	1215	51°24'	128°43'	216	0	25	37	50	75	100	125	150	175	216							
						14.3	14.0	10.8	10.1	8.3	7.2	6.2	5.9	5.8	5.8							
4	12/08	1510	51°19'	129°00'	238	0	28	30	50	75	100	125	150	175	200	217	238					
						14.7	14.4	13.0	10.0	8.5	7.5	6.6	6.4	6.2	5.9	5.7	5.7					
5	12/08	1740	51°13'	129°17'	285	0	25	35	50	75	100	125	150	175	200	215	250	285				
						15.4	15.0	12.0	10.7	9.3	8.0	7.0	6.5	6.1	5.8	5.6	5.5	5.5				
6	12/08	1917	51°07'	129°37'	-	0	25	26	30	40	50	75	100	125	150	175	200	225	250	263		
						15.3	15.3	14.0	11.8	10.0	9.5	8.0	7.2	7.1	7.0	6.7	6.2	5.8	5.7	5.6		
7	12/08	2149	51°21'	129°49'	230	0	25	30	40	50	75	100	125	150	175	200	215	230				
						15.5	15.5	9.5	11.7	10.2	8.4	6.8	6.3	6.0	5.9	5.7	5.5	5.5				
8	13/08	1319	52°00'	129°30'	201	0	25	40	50	75	100	125	150	158	183	201						
						11.4	11.1	9.9	9.5	8.4	7.8	7.2	6.9	6.5	6.3	6.3						
9	13/08	1855	52°30'	130°07'	288	0	18	25	50	60	75	100	125	150	175	200	225	250	288			
						14.5	14.4	13.2	12.0	11.0	9.5	7.6	7.0	6.5	6.0	5.8	5.6	5.3	5.3			
10	13/08	2006	52°40'	130°09	239	0	20	25	50	75	100	125	150	175	200	239						
						14.3	14.2	13.1	12.2	9.8	8.7	7.1	6.7	6.2	5.5	5.2						
11	13/08	2117	52°50'	130°11'	249	0	32	50	75	85	100	125	150	175	200	225	249					
						14.0	13.9	13.4	10.0	9.3	8.5	7.0	6.1	5.8	5.7	5.4	5.4					
12	13/08	2253	53°00'	130°12'	209	0	25	30	40	50	75	100	125	150	155	200	209					
						14.5	14.6	13.5	11.5	10.1	8.5	7.2	6.4	6.1	5.9	5.8	5.8					
13	14/08	2043	53°09'	130°27'	201	0	20	25	50	75	100	125	150	175	201							
						11.1	10.0	9.4	8.3	7.0	6.5	6.3	5.9	5.7	5.6							
14	14/08	2152	53°17'	130°41'	179	0	10	20	25	50	75	100	125	150	179							
						12.7	12.1	12.4	11.7	9.5	8.0	7.0	6.1	5.8	5.8							
15	14/08	2322	53°28'	130°45'	153	0	17	25	30	50	75	100	125	140	153							
						12.5	10.5	10.4	10.0	8.9	7.5	6.5	6.2	5.9	5.9							

Table 11 (cont'd)

AREA: Queen Charlotte Sound/Hecate Strait DATE: August 12-25, 1981 VESSEL: G. B. REED

No.	Day/Mo.	Time (PST)	Position		Bottom depth (m)	Depth (m)/Temperature (°C)																
			Lat. N	Long. W																		
16	15/08	1045	53°43'	130°43'	142	0	05	10	25	50	75	100	120	142								
						11.7	11.5	11.3	10.0	8.2	7.3	6.8	6.7	6.6								
17	15/08	1407	53°50'	130°52'	88	0	10	20	25	50	75	80	88									
						13.0	11.0	9.0	8.7	7.8	7.2	6.9	6.8									
18	15/08	2121	53°57'	131°00'	70	0	05	10	15	25	50	60	70									
						13.6	12.0	10.0	9.2	8.8	8.0	7.2	7.0									
19	15/08	2228	54°07'	131°02'	-	0	10	25	30	40	50	75	85	107								
						12.6	12.0	11.0	10.1	9.7	9.3	8.7	8.0	8.0								
20	16/08	0019	54°17'	131°02'	123	0	10	20	25	50	75	100	123									
						14.3	13.3	11.0	10.0	8.5	6.8	6.7	6.3									
21	23/08	0120	51°16'	130°09'	1012	0	10	25	50	75	100	150	200	250	300	400	500	600	700	800	900	1012
						15.6	15.0	12.5	9.5	7.7	7.3	7.1	6.7	6.2	6.0	5.2	5.0	4.7	4.5	4.1	3.9	3.5
22	23/08	0345	51°11'	130°43'	1410	0	25	30	50	75	100	150	200	250	300	400	500	600	800	1000	1200	1410
						15.7	15.0	11.0	9.0	8.4	7.8	6.9	6.7	6.1	5.5	5.1	4.8	4.5	4.1	3.6	3.4	2.8
23	23/08	0505	51°09'	130°59'	-	0	25	40	50	75	100	150	200	250	300	400	500	600	800	1000	1200	1350
						15.8	14.5	10.0	9.5	8.5	7.7	7.1	6.8	6.2	5.9	5.1	4.9	4.6	4.0	3.6	3.3	3.0
24	23/08	1240	50°55'	132°37'	-	0	25	40	50	75	100	150	200	250	300	400	500	600	800	1000	1200	1413
						16.2	15.9	12.3	10.0	8.1	8.0	7.8	6.5	6.1	5.7	5.2	4.7	4.4	4.0	3.6	3.2	2.8
25	23/08	2300	51°15'	130°18'	-	0	25	40	50	75	100	150	200	250	300	400	500	600	800	1000	1200	1383
						14.9	13.0	11.0	10.4	8.3	7.8	7.2	6.8	6.4	6.0	5.3	5.0	4.6	4.2	3.8	3.5	3.2
26	25/08	0022	51°36'	130°02'	-	0	15	22	25	30	50	52	53	75	100	125	150					
						14.8	14.8	15.1	13.0	12.3	10.8	10.6	10.9	9.5	7.4	6.5	6.1					

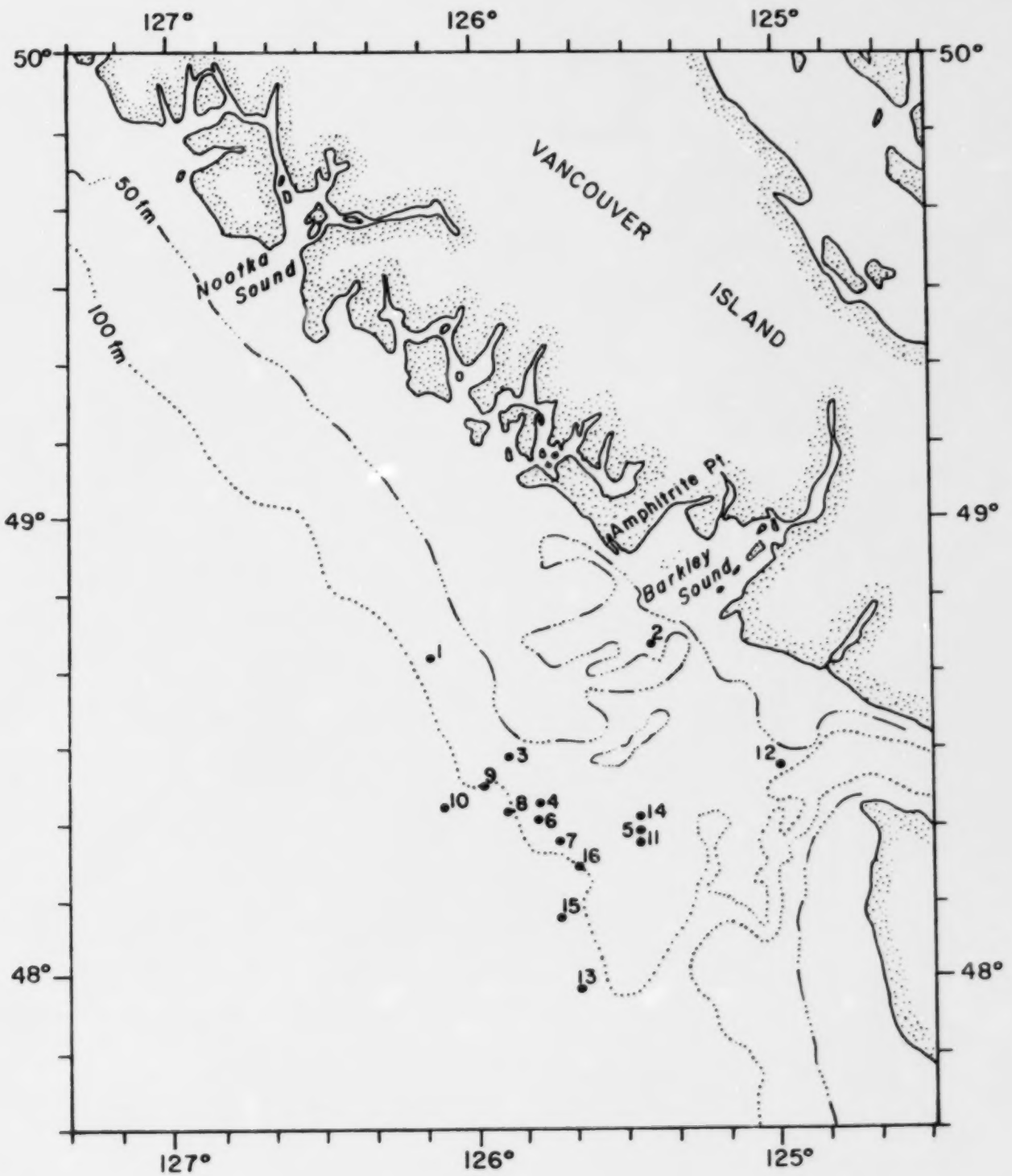

Fig. 12. Station positions, September 10-23, 1981.

Table 12.

AREA: West Coast - Vancouver Island DATE: September 10-23, 1981 VESSEL: G. B. REED

No.	Day/Mo.	Time (PST)	Position		Bottom depth (m)	Depth (m)/Temperature (°C)																Depth (m) Salinity (‰)	
			Lat. N	Long. W																			
1	10/09	1950	48°42'	126°09'	135	0	10	25	33	50	75	100	135										
						12.5	11.5	10.0	9.0	8.2	7.8	6.9	6.7										
2	11/09	1905	48°43'	125°27'	-	0	03	10	25	50	75	90											
						12.6	11.8	11.5	9.6	9.2	8.5	7.9											
3	12/09	1908	48°29'	125°54'	128	0	10	25	50	65	75	100	110	128									
						13.2	12.5	9.5	8.1	8.0	7.5	7.2	6.8	6.8									
4	13/09	1945	48°23'	125°48'	150	0	10	25	50	75	95	100	125	135	150								
						13.1	12.0	9.5	8.2	7.3	7.1	7.1	7.0	6.7	6.6								
5	14/09	1915	48°19'	125°29'	-	0	05	20	25	50	70	75	100	105									
						13.6	13.0	10.0	9.1	8.2	7.7	7.5	7.2	7.0									
6	15/09	1245	48°21'	125°48'	156	0	10	12	25	30	40	50	75	90	100	130	140	154					
						12.3	12.1	11.6	10.5	10.5	8.8	8.5	7.5	7.1	7.0	7.0	6.8	6.7					
7	15/09	2000	48°18'	125°44'	174	0	10	12	25	35	50	55	75	100	110	120	150	165	174				
						12.7	11.1	11.2	9.5	8.3	8.1	7.9	7.4	7.3	7.1	7.2	7.2	7.0	6.9				
8	16/09	1035	48°22'	125°54'	-	0	10	18	23	25	30	50	75	100	125	150	166	170	200				
						13.7	13.3	11.5	11.8	10.5	9.3	8.7	7.7	7.2	7.1	7.1	7.0	6.8	6.7				
9	16/09	1325	48°24'	125°58'	-	0	10	25	30	50	75	100	125	150	185	200	217	232	350	363	415	460	
						14.5	13.5	10.5	9.7	8.7	7.5	7.2	7.0	7.0	6.9	6.7	6.5	6.3	6.2	5.7	5.4	5.4	
10	16/09	1530	48°23'	126°07'	-	0	03	10	20	25	50	63	75	100	125	150	200	250	295	300	460		
						16.2	16.2	16.0	11.2	11.0	8.9	8.0	7.7	7.4	7.3	7.1	6.9	6.7	6.2	6.2	6.1		
11	17/09	0930	48°18'	125°29'	130	0	08	15	25	50	75	100	120	130									
						12.7	12.5	10.5	9.5	7.9	7.5	7.5	7.0	7.0									
12	17/09	1945	48°27'	125°00'	-	0	10	25	50	62	70												
						13.0	12.9	10.8	8.0	7.7	7.0												
13	18/09	1930	47°58'	125°40'	-	0	10	25	50	75	100	120	150	180	200	250	300	350	360	400	460		
						15.3	15.2	9.5	9.0	8.3	7.5	7.2	7.2	7.0	6.9	6.8	6.6	6.5	6.3	5.8	5.6		
14	22/09	1900	48°21'	125°29'	133	0	20	25	40	50	60	75	100	105	133								
						13.0	11.3	9.3	8.3	8.3	7.9	7.8	7.5	7.4	7.4								
15	23/09	0950	48°08'	125°44'	-	0	30	38	50	75	100	125	143	150	200	221							
						14.1	14.0	9.5	9.0	7.8	7.6	7.3	7.1	7.1	7.1	7.1							

Table 12 (cont'd)

AREA: West Coast - Vancouver Island **DATE:** September 10-23, 1981 **VESSEL:** G. B. REED

No.	Day/Mo.	Time (PST)	Position		Bottom depth (m)	Depth (m)/Temperature (°C)															Depth (m) Salinity (‰)	
			Lat. N	Long. W		0	12	25	50	75	100	125	150	175	200	225						
16	23/09	1315	48°14'	125°40'	-	13.8	13.7	9.8	8.5	7.7	7.5	7.2	7.2	7.2	7.1	7.0						

III. SUMMARY OF OCEANOGRAPHIC CONDITIONS, 1980-81

1. Monthly and Annual Sea-Surface Temperature Anomalies at British Columbia Lightstations.

Monthly sea-surface temperature anomalies (monthly mean minus long-term monthly mean) at lightstations along the outer coast and in Queen Charlotte Sound and Hecate Strait (Fig. 13) indicate above-average temperatures for the coastal waters during January-September 1980, and generally much above-average temperatures for the remainder of 1980 and throughout 1981 (Table 13). Anomalies in October 1980-March 1981 and September-December 1981 were generally larger than those for the corresponding months of 1957-58 (Table 13). However, the anomalies in April-August 1981 were generally smaller than those in April-August 1958, but still indicate anomalously warm surface conditions in the coastal waters.

Annual sea-surface temperature anomalies at the lightstations in 1981 appeared to be as large or slightly larger than those reported for 1958 (Table 13).

2. Monthly Ekman Transport and Sea Level Anomalies, 1980-81.

The anomalously warm sea-surface conditions at the lightstations during October 1980-March 1981 were generally associated with anomalously large onshore Ekman transport along the west coast of Vancouver Island and along the seaward entrance to Queen Charlotte Sound, as indicated by the large positive anomalies at 48°N, 125°W and 51°N, 131°W, especially at the former grid point (Table 14). The monthly mean onshore transport for January 1981 was particularly large, indicating the presence of a strong convergent state. Sea levels were also anomalously high in January 1981 at Tofino, B.C. and very high at Prince Rupert, B.C. (Table 14). High sea levels prevailed at Prince Rupert from October 1980 through June 1981.

The large positive monthly anomalies in sea-surface temperature, onshore Ekman transport and sea level are considered to reflect an intensification in the normal northerly flow along the west coast of Vancouver Island, and a relatively strong northerly flow in Hecate Strait, during most of October 1980-March 1981, with the strongest flows during January.

3. Temperature Conditions, West Coast of Vancouver Island, 1980-81.

In late January 1980, bottom-water temperatures on the continental shelf seaward of Kyuquot Sound (see Fig. 1) ranged from about 10° (75 m) to 7.4°C (200 m) (Fig. 14). Near-shore temperatures appeared to be lower than

Fig. 13. Locations of British Columbia shore stations making daily oceanographic observations. (Underlined stations are reported.)

Table 13. Monthly and annual sea-surface temperature anomalies (°C) at lightstations along the British Columbia coast, 1980-81 and 1957-58. (Anomalies are with respect to the long-term means; positive values indicate above-average temperatures, negative values, below-average temperatures.)

	J	F	M	A	M	J	J	A	S	O	N	D	ANN
						1980							
Amphitrite Pt.	0.1	0.6	0.6	0.9	0.8	0.5	0.1	0.2	0.1	0.6	1.2	0.7	0.6
Kains Is.	0.6	0.8	1.0	0.5	0.7	0.7	0.7	-0.9	-0.5	1.0	1.1	0.9	0.6
Cape St. James	1.0	1.1	0.9	0.8	0.6	1.0	0.6	0.3	0.1	0.3	0.9	0.8	0.8
Langara Is.	-0.6	1.0	0.6	0.3	0.6	0.4	1.2	1.0	2.0	1.3	0.8	0.5	0.6
McInnes Is.	0.5	0.5	0.6	0.5	0.6	0.1	0.7	0.0	-0.8	0.1	1.2	0.4	0.3
Bonilla Is.	0.5	0.8	0.6	0.4	0.1	0.1	0.3	0.0	0.8	0.4	1.3	0.7	0.0
						1981							
Amphitrite Pt.	2.1	1.5	1.6	0.8	0.9	0.9	0.8	0.6	0.5	1.0	1.3	0.6	1.1
Kains Is.	1.9	1.5	1.5	1.1	0.7	1.2	0.6	-0.2	1.3	-0.1	0.8	0.6	1.0
Cape St. James	1.5	1.8	1.8	1.3	1.0	0.7	1.2	1.8	0.9	1.1	1.2	0.8	1.3
Langara Is.	1.8	1.6	1.8	1.1	1.6	2.3	1.9	1.7	2.2	0.5	0.8	0.1	1.5
McInnes Is.	1.5	1.3	1.7	0.8	0.6	0.7	-0.3	0.3	1.1	0.8	1.5	1.1	0.9
Bonilla Is.	2.1	1.6	1.8	1.2	1.1	2.4	0.8	0.6	1.6	0.9	1.3	1.1	1.3
						1957							
Amphitrite Pt.	-1.1	-1.2	-0.8	-0.3	0.1	-0.1	0.2	0.6	1.3	0.7	1.1	1.0	0.1
Kains Is.	-0.7	-0.7	-0.8	-0.3	0.3	0.6	0.5	1.6	0.6	0.5	0.8	1.0	0.3
Cape St. James	-	-	-1.4	-1.9	-0.9	-0.3	1.1	0.5	0.1	0.9	0.2	-0.7	-0.6	-0.1
Langara Is.	-0.4	-0.6	-0.8	-0.5	-0.3	0.3	0.5	0.6	1.3	0.5	1.6	0.2	0.2
McInnes Is.	-1.6	-1.2	-0.6	-0.5	-0.1	0.3	0.2	1.0	0.9	-0.5	0.3	0.6	-0.2
						1958							
Amphitrite Pt.	1.3	1.9	1.2	1.2	1.3	2.1	2.2	1.4	0.5	-0.2	0	1.1	1.1
Kains Is.	1.3	1.7	0.5	1.1	1.1	1.5	0.5	0.2	0.1	-0.2	-0.1	0.8	0.8
Cape St. James	0.1	0.4	0.5	0.3	0.1	2.3	2.7	1.6	1.0	0.3	-0.3	0.1	0.8
Langara Is.	1.2	1.2	1.2	2.1	1.8	-	-0.2	-0.5	-	-	-	-	-
McInnes Is.	0.9	1.0	1.1	1.5	1.3	1.1	-0.1	0.9	0.1	0	-0.2	0.6	0.6

Monthly means for 1980-81 were provided by Dr. L. Giovando, Institute of Ocean Sciences, Sidney, B.C.

Note: Observations at Bonilla Island did not commence until 1960.

Table 14. Monthly anomalies of Ekman transport normal to the coast and sea level, 1980-81.

	J	F	M	A	M	J	J	A	S	O	N	D
	Ekman Transport Anomalies (cu m/sec/100 m of coastline											
48°N, 125°W - 1980	-11	153	-22	16	-41	-32	-63	-68	-5	39	145	113
- 1981	172	11	-3	2	10	23	-46	-	9	-23	41	11
*Monthly mean 1946-80	79	65	19	-1	-18	-28	-34	-25	-3	33	82	91
51°N, 131°W - 1980	-34	61	-26	107	-6	-10	-6	-56	-18	37	27	-7
- 1981	263	-40	66	-4	15	0	-55	-	42	-43	36	-2
*Monthly mean 1946-80	46	49	11	8	-1	-14	-13	-14	1	44	50	47
	Sea level anomalies (cm)											
Tofino, B.C. - 1980	1.6	6.2	-1.8	2.5	-1.1	-2.6	-7.3	-4.4	-3.3	-6.5	-2.2	0.5
- 1981	56	-0.2	-1.8	-2.7	2.0	2.2	-1.6	-1.7	-0.3	4.4	11.2	3.6
*Monthly mean 1943-82	225.1	222.7	216.1	208.1	202.5	203.2	202.7	205.9	208.5	213.8	221.9	228.1
Prince Rupert, B.C. 1980	2.1	7.9	1.9	10.2	1.5	0.9	0.5	0.6	2.9	2.7	10.2	5.4
1981	18.2	6.7	9.6	8.6	9.0	13.2	-0.2	-1.7	9.6	3.3	15.4	9.1
*Monthly mean 1943-82	391.4	389.6	383.6	378.45	375.2	376.8	374.4	374.9	378.7	389.2	394.6	395.7

*Positive values indicate onshore transport (positive anomalies indicate large onshore transport); negative values, offshore transport (negative anomalies indicate large offshore transport).

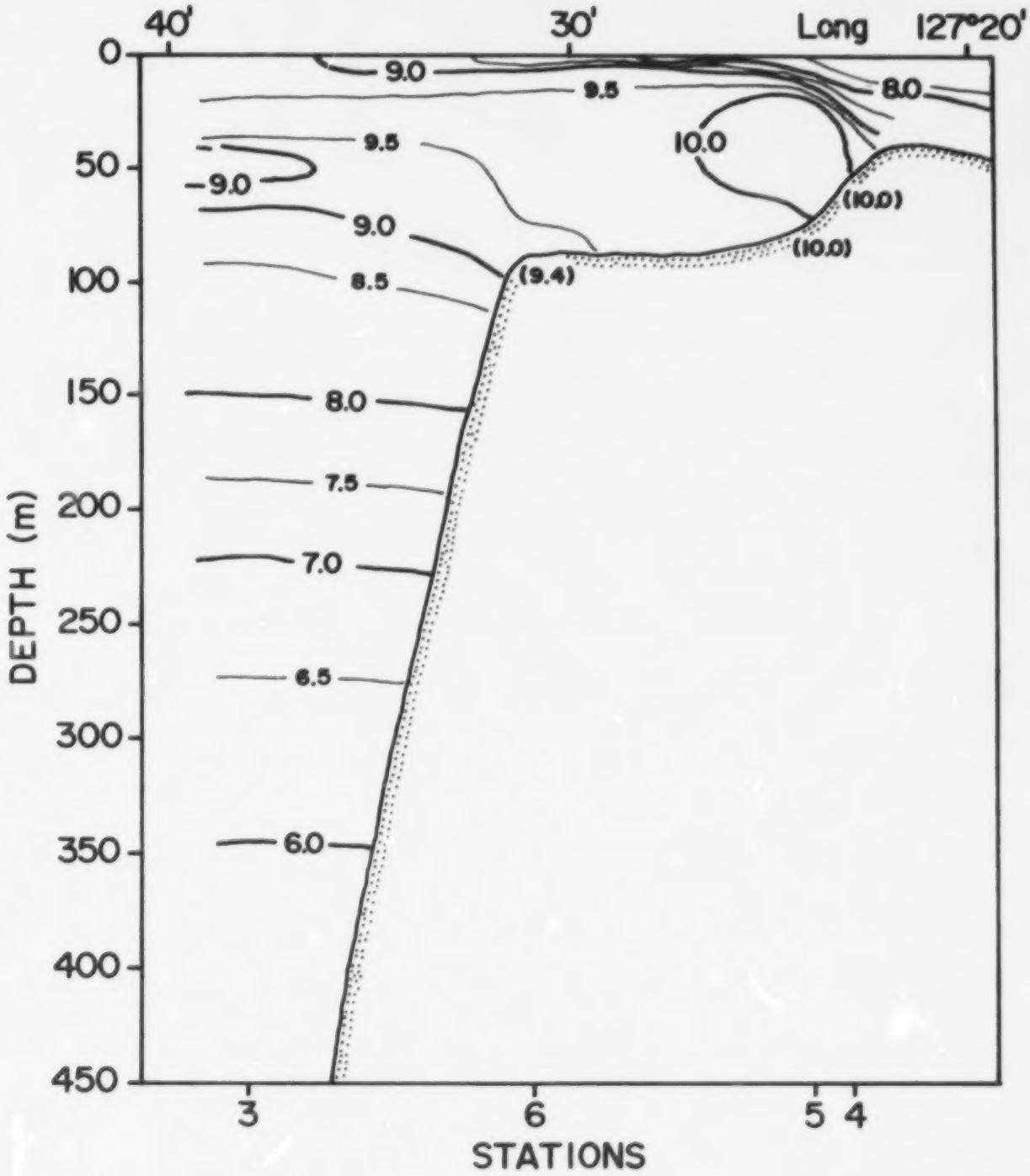

Fig. 14. Temperature (°C) seaward of Kyuquot Sound, Vancouver Island, January 25-26, 1980.

those to seaward. Also, surface temperatures from the coast to about midshelf (100 m depth) were lower than those of the underlying waters.

By late May-early June 1980, bottom temperatures ranged from about 8.8° (75 m) to 6.3°C (200 m) seaward of Amphitrite Point (Fig. 15) and from about 8.0° (75 m) to 6.6°C (200 m) off southern Vancouver Island (Fig. 16) (see Fig. 3 for locations of the two sections), considerably lower than those observed in late January off Kyuquot Sound (Fig. 14). Bottom temperatures were highest near the coast during this period. The transport data indicate a shift from a convergent condition in April to a relative strong divergent condition during May off southern Vancouver Island (Table 14). The doming of the isotherms in the vicinity of the depression in the bottom topography at long. 125° 15'W in the southern section (Fig. 16) may indicate the development of an upwelling center that has been observed in this general area in summer. Recently, Freeland and Denman (1982) have proposed a mechanism for its formation; it is reported to be topographically-controlled.

Mean bottom-water temperatures at corresponding depth intervals between Amphitrite Point and Estevan Point were found to be generally similar for May 1981, 1980, and 1979 and appeared to be higher than in May 1977 and 1978 (Table 15).

In mid-August 1980, bottom-water temperatures on the continental shelf seaward of Quatsino Sound ranged from about 8.2° (75 m) to 6.3°C (200 m) (Fig. 17). In late May 1980, bottom-water temperatures were 8.5° (75 m) and 6.3°C (200 m) seaward of Amphitrite Point, indicating little change in bottom conditions from May to August in 1980.

In early February 1981, the anomalously warm conditions that prevailed in the coastal surface waters, as indicated by the large positive anomalies at the lightstations (Table 13), were also observed in the bottom waters of the continental shelf, at least from Amphitrite Point southward. Bottom temperatures ranged from about 10.5° (75 m) (Fig. 18 and 19) to 8°C (200 m) (Fig. 19) (see Fig. 5 and 6 for the locations of the two sections), and were about 0.5°C higher than those observed seaward of Kyuquot Sound in late January 1980 (Fig. 14). Temperature conditions adjacent to the coast were colder than those over midshelf, as was also evident in January 1980. At a depth of 350 m, the temperature appeared to be about 0.5 higher in early February 1981 (seaward of Amphitrite) (Fig. 19) than in late January 1980 (seaward of Kyuquot Sound) (Fig. 14), and about 1.3°C higher than in May-June 1980 (Fig. 15 and 16). In early March 1981, temperatures throughout the water column were still relatively high (Fig. 20 and 21). These conditions were preceded by anomalously large onshore transport (January) (Table 14).

4. Temperature Conditions in Queen Charlotte Sound and Hecate Strait, 1980-81.

Although the data are few in Goose Island Gully in Queen Charlotte Sound (Fig. 11), they indicate similar bottom-water temperatures during May 18-20, 1981 (Table 7) and July 6-10, 1981 (Table 9); mean values were 6.1

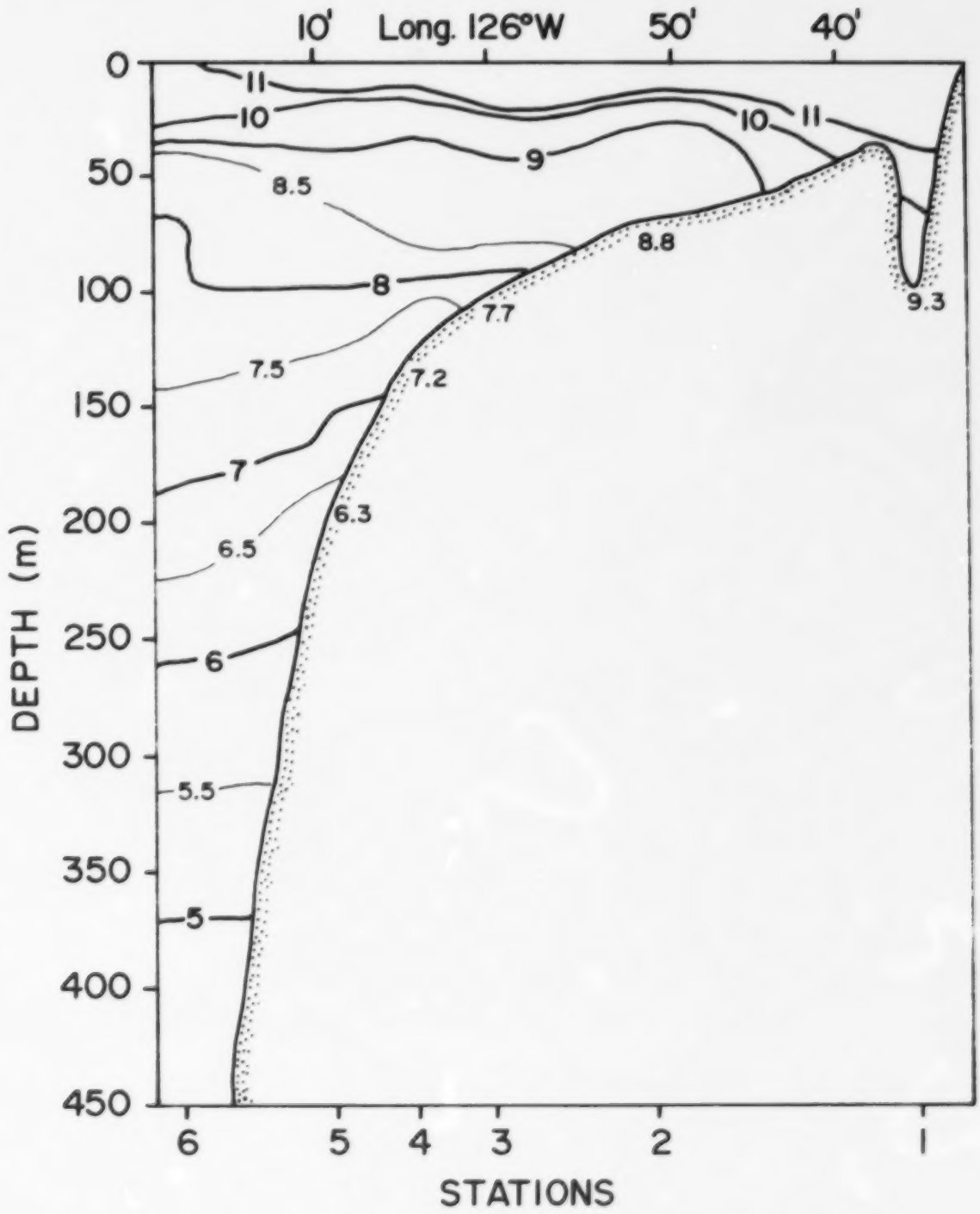

Fig. 15. Temperature (°C) seaward of Amphitrite Point, Vancouver Island, May 26, 1980.

Fig. 16. Temperature (°C) off southern Vancouver Island, June 7, 1980.

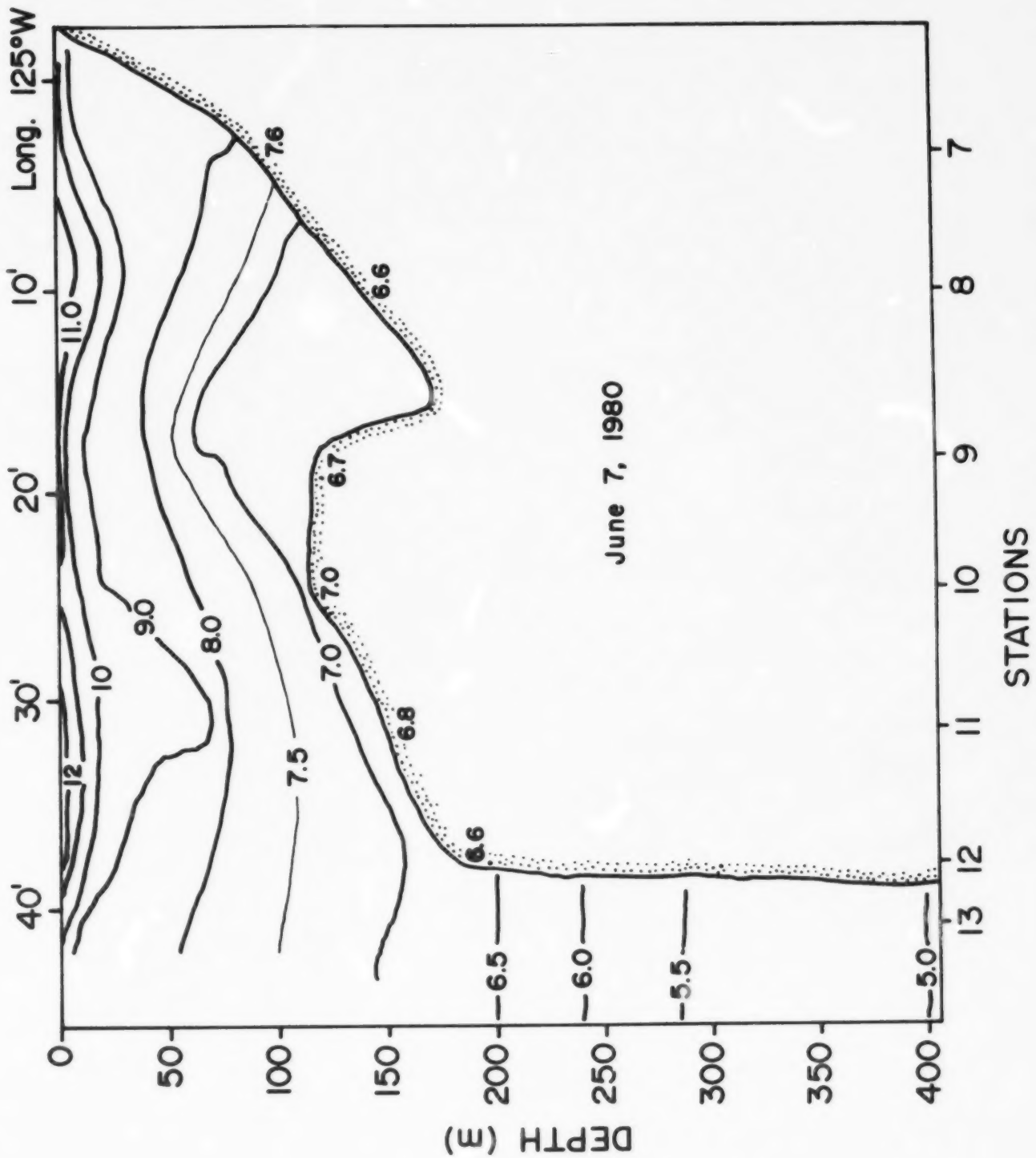
Long. 125°W
40'
30'
20'
10'
11.0
12
10
9.0
8.0
7.5
7.0
6.8
6.6
7.0
6.7
7.6
6.6
June 7, 1980
0
50
100
150
200
250
300
350
400
DEPTH (m)
6.5
6.0
5.5
5.0
13
12
11
10
9
8
7
STATIONS

Table 15. Mean bottom-water temperatures (°C) by depth interval (m) on the continental shelf between Amphitrite Point and Estevan Point, Vancouver Island, May 1977-81.

Depth interval (m)	Range (°C)		Mean (°C)				
	1981	1980	1981	1980	1979	1978	1977
91-108	7.5-8.2	8.1-8.5	8.0(6)	8.2(3)	7.9(7)	7.7(6)	7.3(8)
109-126	7.2-7.7	7.4-8.2	7.5(6)	7.8(9)	7.7(7)	7.5(14)	7.1(10)
127-145	6.8-7.5	7.3-8.3	7.3(5)	7.5(9)	7.4(9)	7.1(20)	7.0(7)
146-163	7.1-7.4	7.0-7.4	7.2(2)	7.1(3)	7.2(4)	6.9(7)	6.7(4)
164-181	6.9-7.0	-	6.9(2)		7.0(2)		

Numbers in brackets indicate number of observations.

Data for May 1977-79 are from Dodimead et al. (1979a,b) and Dodimead and Ballantyne (1980).

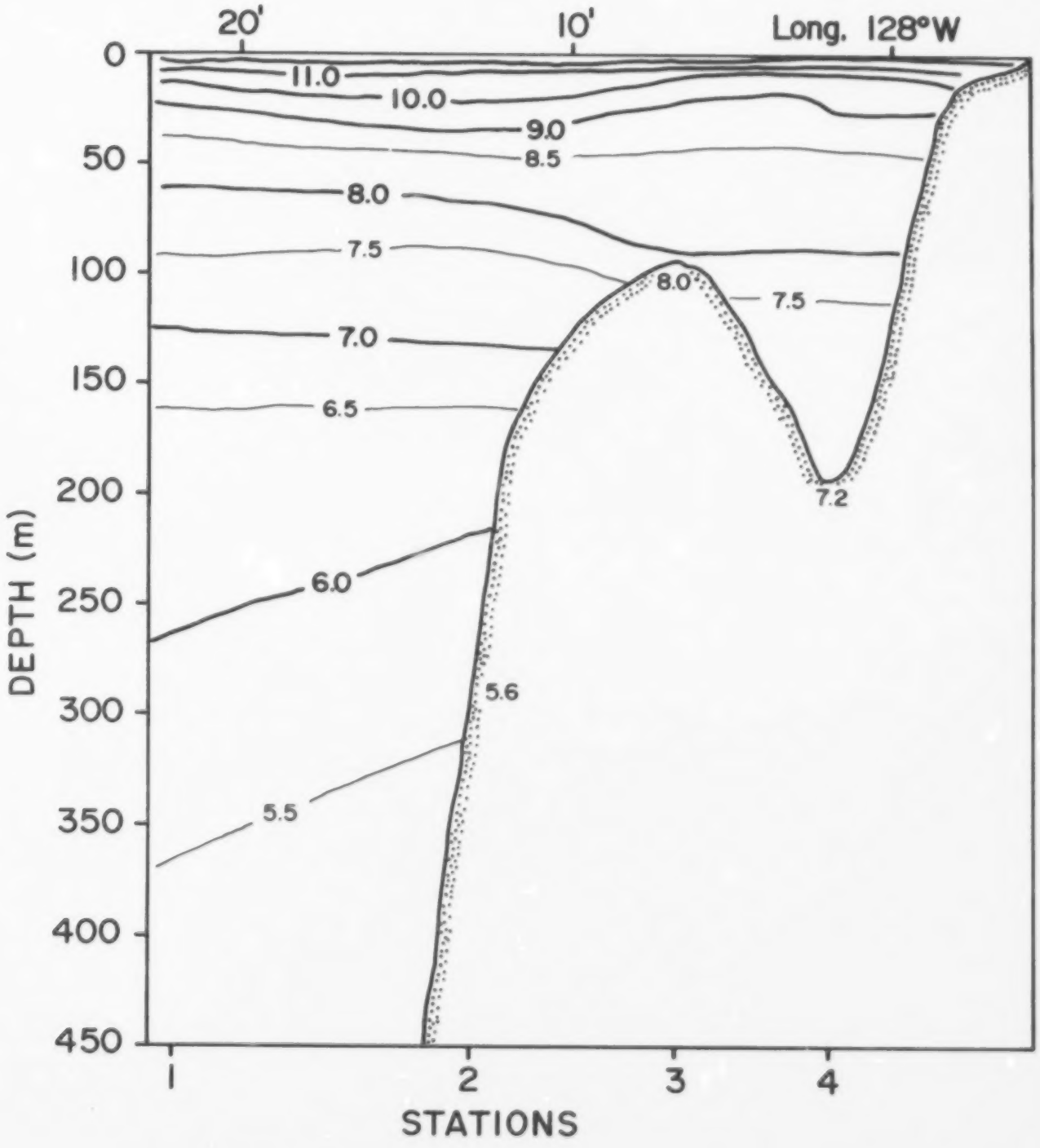

Fig. 17. Temperature (°C) seaward of Quatsino Sound, Vancouver Island, August 8-13, 1980.

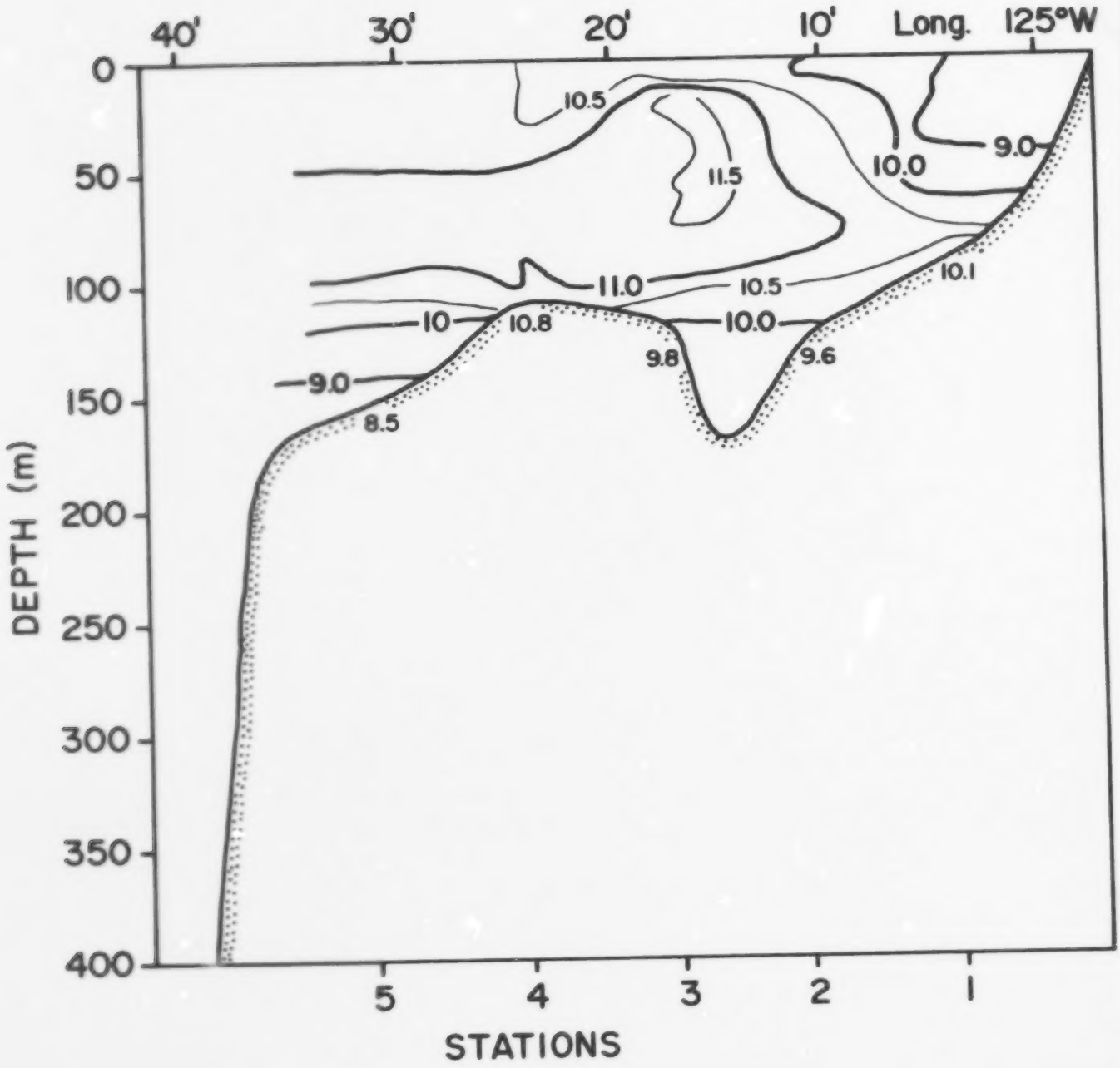

Fig. 18. Temperature (°C) off southern Vancouver Island, February 1, 1981.

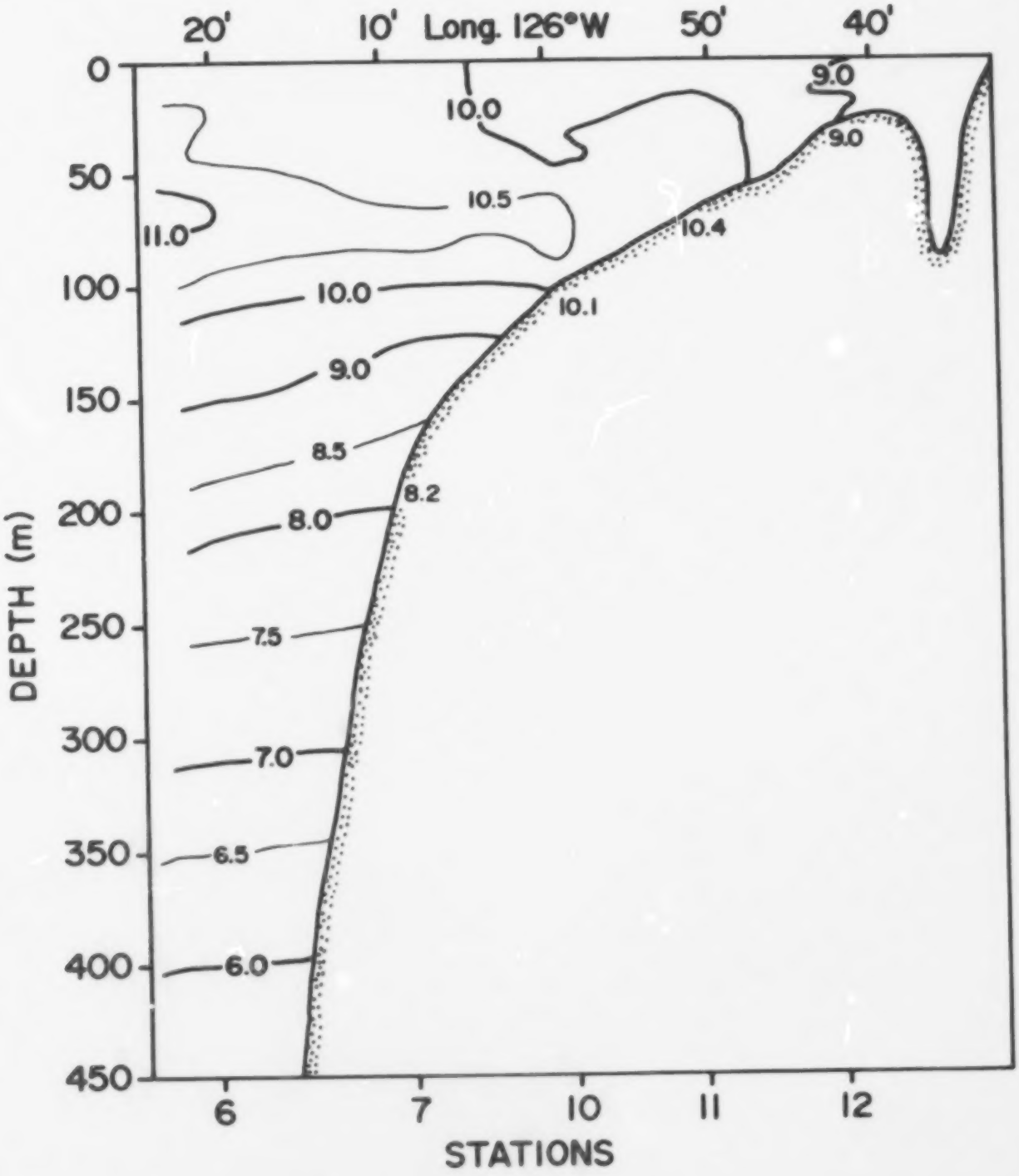

Fig. 19. Temperature (°C) seaward of Amphitrite Point, Vancouver Island, February 2-3, 1981.

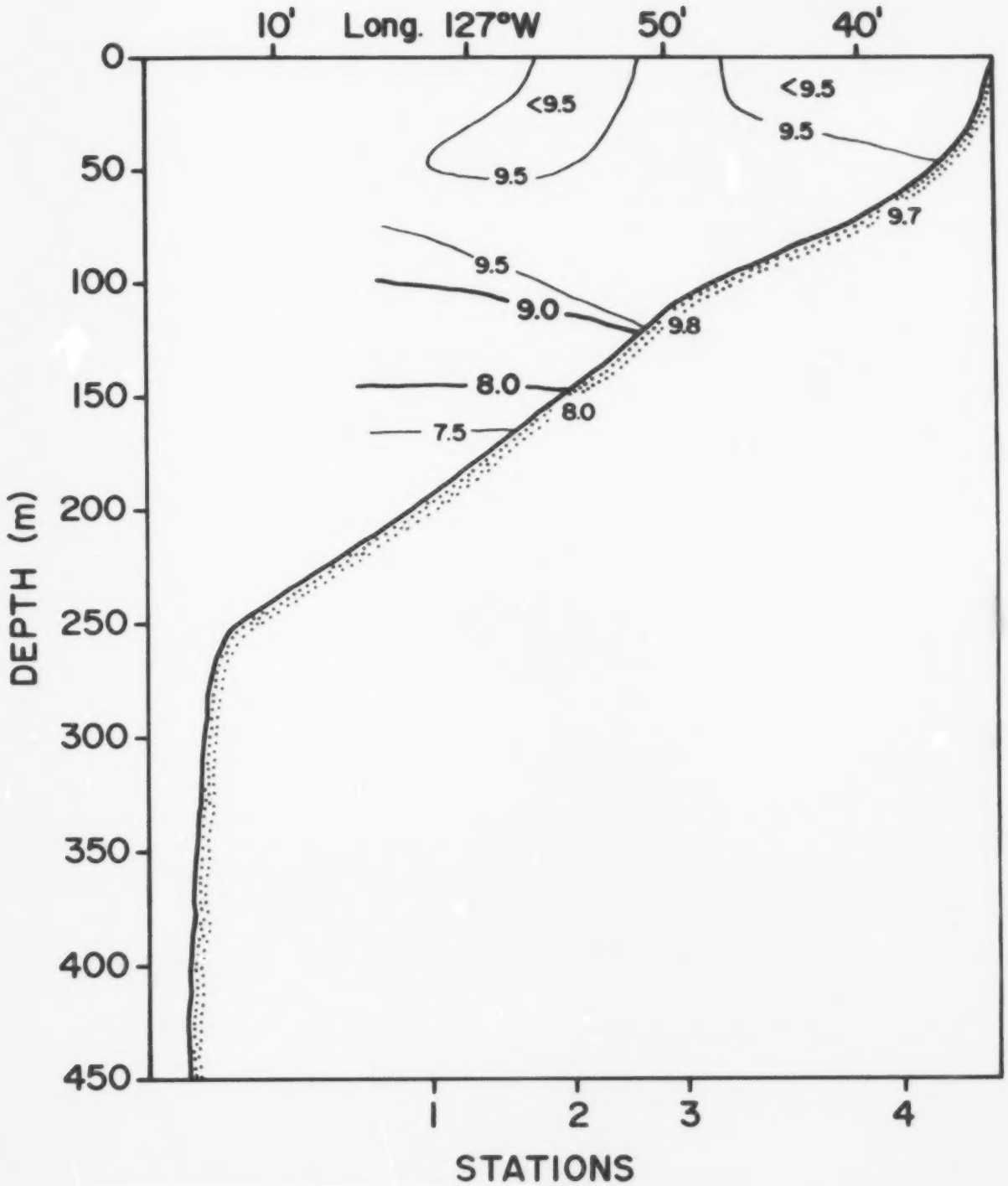

Fig. 20. Temperature (°C) seaward of Nootka Sound, Vancouver Island, March 8, 1981.

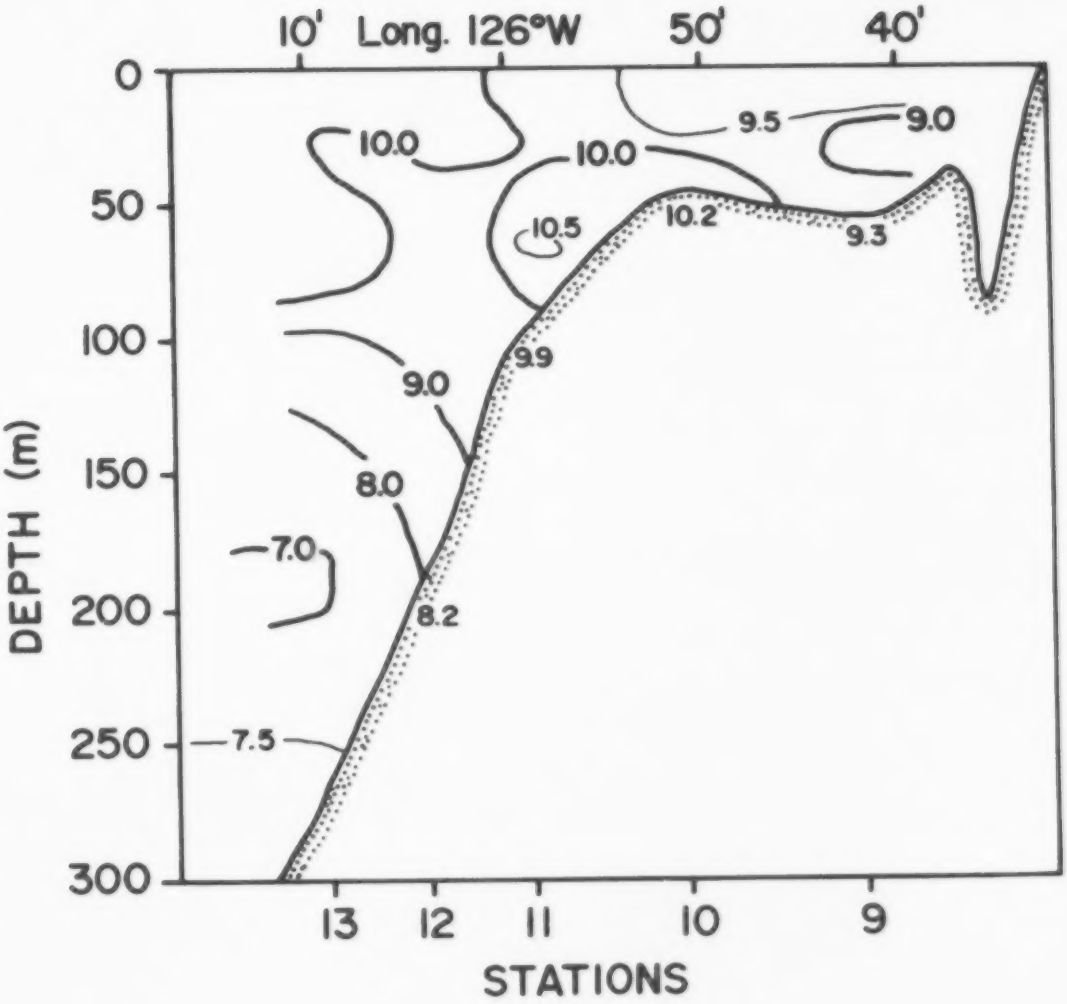

Fig. 21. Temperature (°C) seaward of Amphitrite Point, Vancouver Island, March 14, 1981.

and 5.9°C, respectively, in a bottom depth interval of 190-225 m, and are considered about average for these times of the year. By mid-August 1981, bottom-water temperatures ranged from 5.8° (215 m) to 5.3°C (285 m) (Fig. 22). The deeper waters appeared to be colder (~0.5°C) in August 1981 than in late August 1978 (Dodimead et al. 1979b).

In Hecate Strait, bottom-water temperatures along a north-south transect (Fig. 11) ranged from about 5.3° (300 m) to 8.0°C (100 m) in mid-August 1981 (Fig. 23). A comparison to data collected along this transect during summer in other years, July 30 and September 1-11, 1978 (Dodimead et al. 1979b) and June 27-July 12 and September 7-8, 1979 (Dodimead and Ballantyne 1980) indicates that the maximum variation in bottom temperatures at depths greater than about 240 m was 0.4°C for these periods. At depths less than 240 m, there appeared to be an increase in temperatures from June-July to early September. The increase was generally greater than the interannual variation for each of these periods for these years.

The apparent doming of the isotherms in the upper layer at lat. 53°10' was also evident within 20 miles of this location in 1979-June 27-July 12 at lat. 52°50'N, and September 7-8 at about lat. 53°20'N. There was slight evidence that this feature also existed on July 30, 1978 at lat. 53°10'N, but it was absent during September 1-11, 1978.

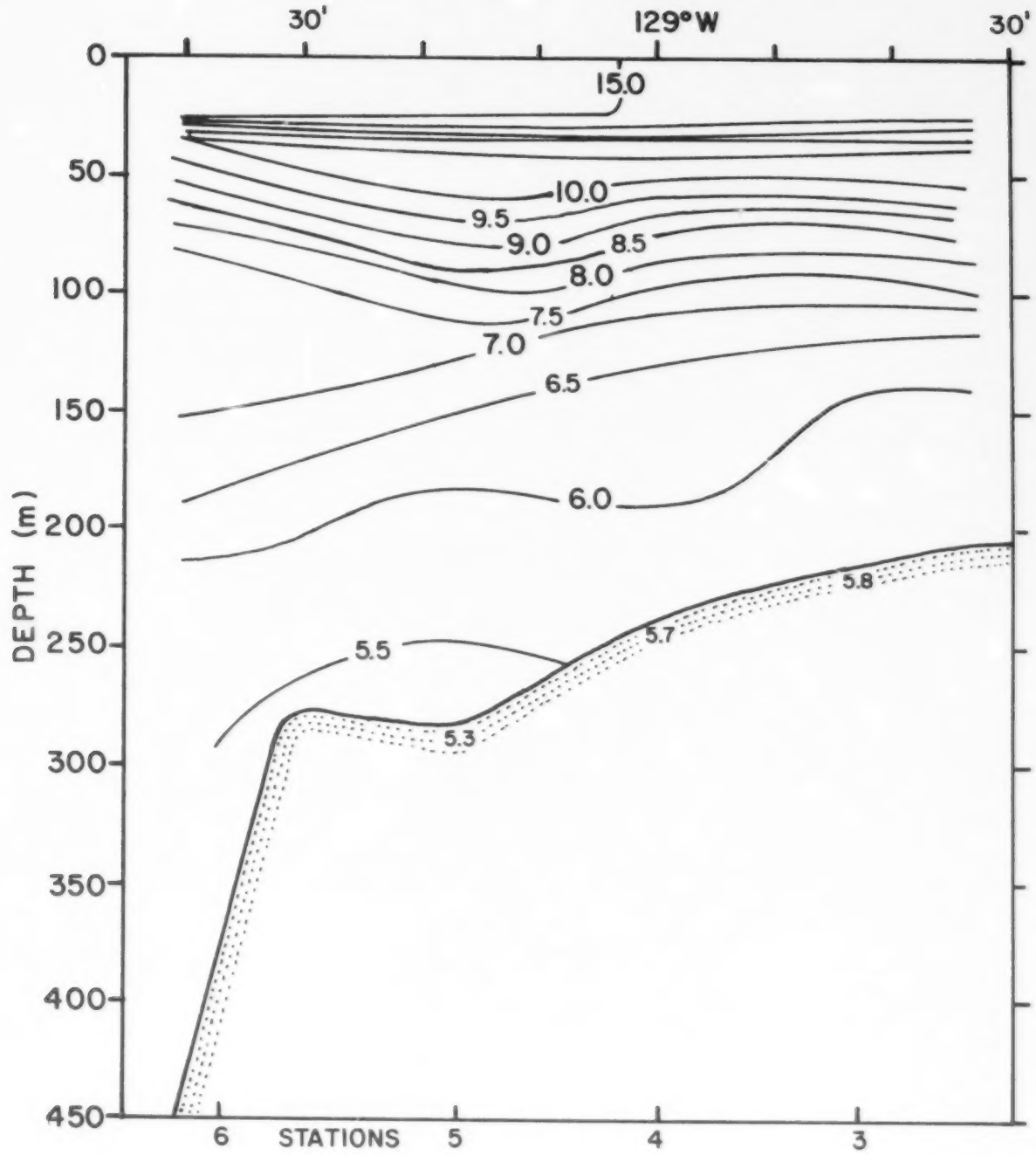

Fig. 22. Temperatures (°C) in Goose Island, Gully, Queen Charlotte Sound, August 12, 1981.

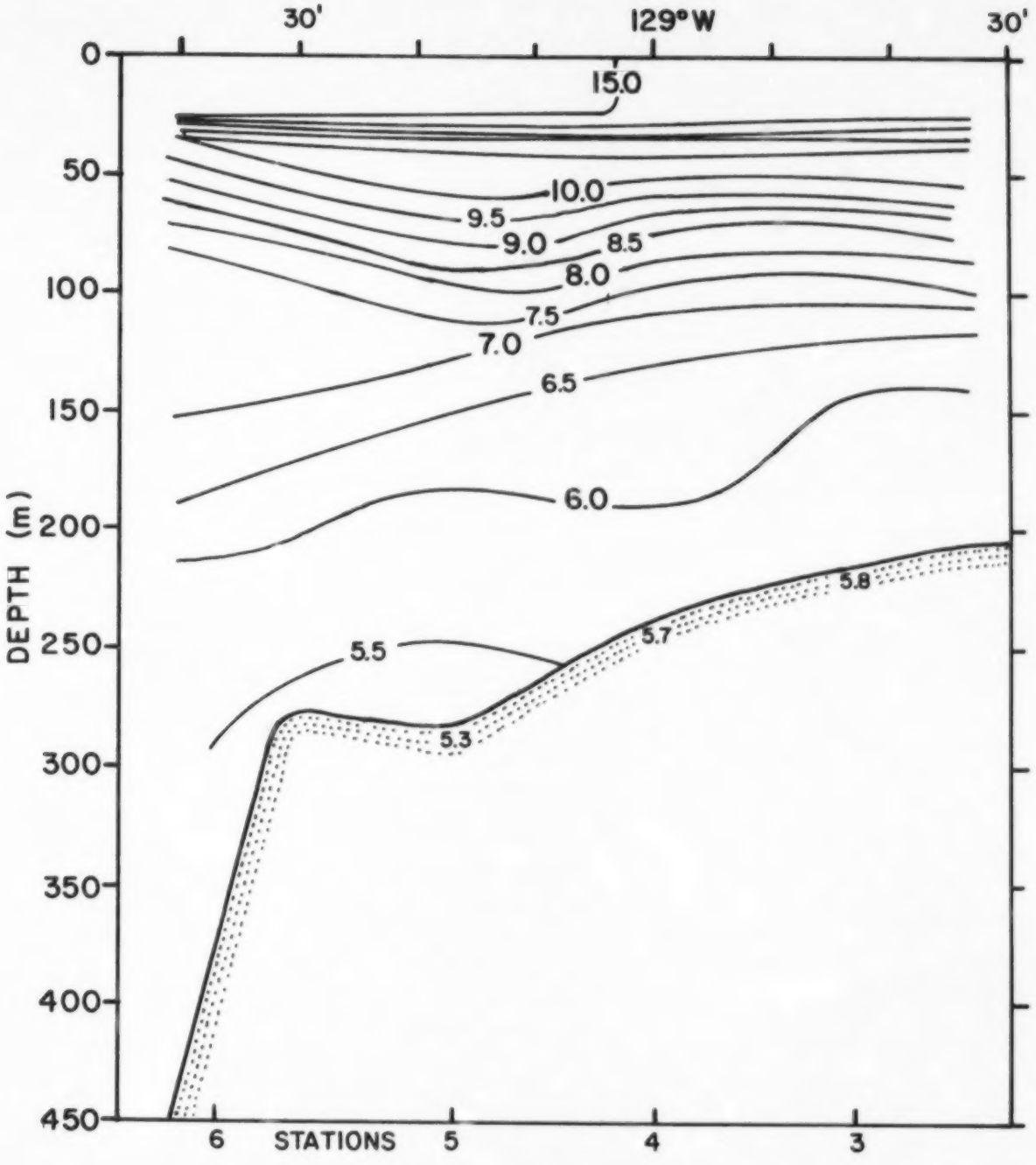

Fig. 22. Temperatures (°C) in Goose Island, Gully, Queen Charlotte Sound, August 12, 1981.

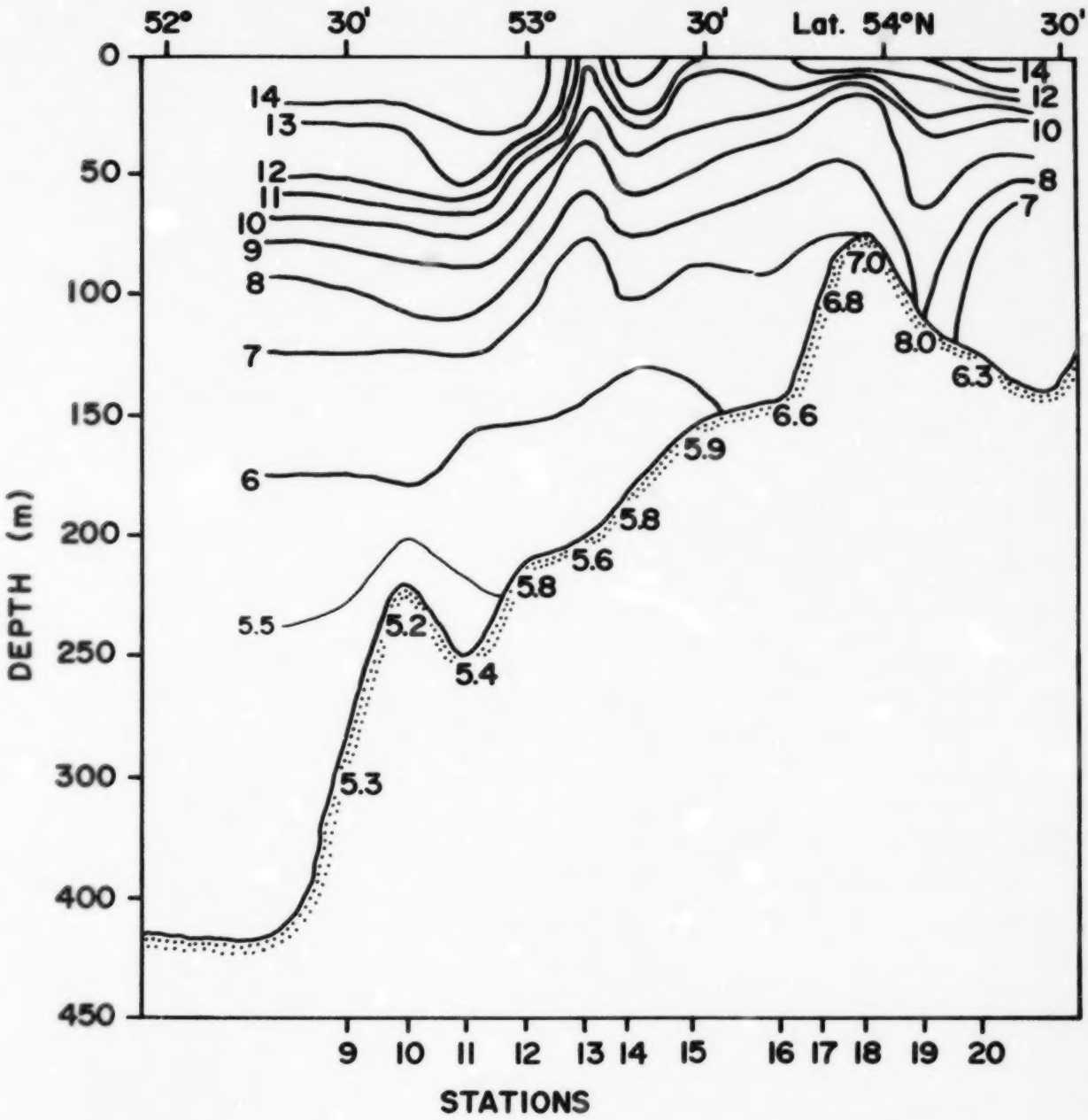

Fig. 23. Temperature (°C) along the deep trench in Queen Charlotte Sound-Hecate Strait, August 13-16, 1981.

ACKNOWLEDGMENTS

The author would like to thank Dr. L. F. Giovando for reviewing the report.

REFERENCES

Dodimead, A., A. Ballantyne, and M. Douglas. 1979a. Oceanographic observations during fisheries research surveys off the British Columbia coast in 1977. Fish. Mar. Serv. Data Rep. 144: 41 p.

1979b. Oceanographic observations during fisheries research surveys off the British Columbia coast in 1978. Fish. Mar. Serv. Data Rep. 160: 136 p.

Dodimead, A. J., and A. Ballantyne. 1980. Oceanographic observations during fisheries research surveys off the British Columbia coast in 1979. Can. Data Rep. Fish. Aquat. Sci. No. 210: 90 p.

Freeland, Howard J., and Kenneth L. Denman. 1982. A topographically controlled upwelling center off southern Vancouver Island. J. Mar. Res. Vol. 40(4): 1069-1093.

POOR

QUALITY

ORIGINAL